

ABSTRACT

Concrete is most likely the most widely utilised building material on the planet. It is used in a wide range of constructions and has a wide range of building applications. It does, however, have one big drawback: despite its high compression strength, it has a low tensile strength. Two approaches are used to remedy this issue. These are steel reinforcing bars and prestressing. However, due to durability limits and construction difficulty, steel bars are not always ideal for reinforcing concrete. The construction of thin concrete components, such as concrete overlays and thin architectural elements, is one example. Furthermore, steel bars installed in thin concrete sections are prone to corrosion due to insufficient concrete cover. This study investigated the use of geogrids as an alternative to steel reinforcement for thin sections. Geogrids are geosynthetic materials that have been widely employed to improve the performance of soil and pavement systems. However, research on the use of geogrids to reinforce concrete beams is limited. The study involved the construction and testing of a series of plain concrete beams and concrete beams with one and two layers of geogrid reinforcement. The beams had dimensions of 100mm by 100mm by 500mm and were subjected to three-point bending tests to determine their flexural strength and behaviour under load. The performance of the reinforced and unreinforced beams was compared to evaluate the effectiveness of the geogrid reinforcement in improving the flexural strength of the beams.

It was noted that geogrid reinforcement did not necessarily increase the peak flexural strength of plain concrete by a significant margin. The doubly reinforced concrete beams did however have a greater flexural strength than the singly reinforced ones. While the simple concrete beam failed instantaneously, the geogrid-reinforced concrete beams experienced extensive crack propagation with huge crack mouth openings before failing. The geogrid reinforcement increased the load-carrying capacity of the beams while decreasing deflection after failure. This suggests that geogrid reinforcement can be a viable method for enhancing the flexural strength of concrete beams, particularly in applications with large loads. The contribution and performance of geogrid reinforcement for smaller concrete sections is promising for concrete overlay and thin architectural section applications. Their ability to control reflective cracking by absorbing concentrated loads at the crack tips and delaying crack propagation is particularly advantageous. When cracks appear in the overlay, the geogrids can regulate the crack width.