

## A Comparative Study of Injection Technique to Enhance Clay Shale Strength Using Cement Paste and Geopolymer

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<b>Abstract</b>	<p>Injection grouting is one of the most suitable techniques for enhancing the strength of degraded clay shale due to its capacity to reach greater depths. However, the appropriate injection material is necessary for improved grouting spreading area and soil strength. This research compared the performance of cement pastes and geopolymers derived from fly ash as grouting materials. In order to achieve the research objectives, grouting column dimension and unconfined compressive strength were evaluated on 24 grouted samples in the laboratory in conjunction with variations in relative compaction, water-cement ratio, and activator-fly ash ratio of geopolymer. Based on the results, it can be stated that fly ash-based geopolymer performs better than cement paste. Injection of geopolymer provided a greater grouting area, which increased soil strength substantially more than cement paste. Clay shale fragments absorb water during the injection of cement paste, hence shortening the initial setting time of cement paste. Consequently, cement paste instantly turns into a solid structure, thereby limiting the area of spreading. Lower relative compaction and greater water-cement or activator-fly ash ratios were also shown to enhance grouted column dimensions and reduce grouted column strength. In addition, the combination of grouted column size and grouted column strength influenced the increase in grouted sample strength.</p>
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