

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 22-462 (project 509) | June 2022

Expansive Soil Mitigation for Transportation Earthworks by Polymer Amendment



the **ISSUE**

Expansive soils exist across a large portion of the Mountain-Plains region. The shrink-swell behavior of these soils damages transportation infrastructure, reducing the length and level of service. Polymer treatments to mitigate expansive soils are available, but their effectiveness relative to conventional chemical stabilizers is not fully known.

the **RESEARCH**

A survey of state departments of transportation within the Mountain-Plains region (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming) was conducted to define the state-of-practice in expansive soil mitigation. Lime and fly ash were identified as the most-used soil stabilizers. Four commercially available polymers were tested in comparison with lime and fly ash. Untreated and treated soils were classified and tested for swelling pressure, swelling potential, unconfined compressive strength, and permeability to water.



A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University

University of Colorado Denver
University of Denver
University of Utah

Utah State University
University of Wyoming



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Project Title

Expansive Soil Mitigation for
Transportation Earthquakes

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the FINDINGS

Relative to untreated soil, polymer treatments were less effective at reducing the swelling potential and increasing compressive strength of a highly expansive soil relative to lime and fly ash. However, lime and fly ash treatments resulted in substantial increases in permeability to water of the treated soil, while polymer treatments did not. Polymer was also shown to be an effective spray-on coating to limit water ingress. Because changes in water content govern volume change of expansive soil, the lower permeability of polymer treated soils represents an alternate path to swelling mitigation. The results illustrate that commercially available polymers reduce swell in expansive soils by mechanisms that are different than lime and fly ash.

the IMPACT

The results of this study illustrate that state-of-the-art polymer amendments for expansive soil allow for more sustainable transportation infrastructure if used in a manner that accounts for the different mechanisms by which the polymer amendments mitigate shrink-swell behavior.

For more information on this project, download the Main report at <https://www.ugpti.org/resources/reports/details.php?id=1081>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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