

**Subject:** TODAY: Hudson Dorian's thesis defense, 10 am, BH323

July 20, 2023

MS Civil Engineering

Hello Folks,

Please join me in support of our own, Hudson Dorian, as he defends his thesis. Details are below, thanks!

### ***“Feasibility Study for Field-scale use of Ureolysis-induced Calcite Precipitation (UICP) for Roadbed Improvement”***

Abstract:

“A series of tests were conducted to evaluate the feasibility of using ureolysis-induced calcium carbonate precipitation (UICP) to improve the strength of the soil layers used to in the construction of roads. This process involved three series of tests conducted on soil specimens of gradually increasing volume.

The first series regarded the relative effect of treatment direction, comparing top-down treatment to bottom-upwards and alternating treatment methods on 50-by-100-millimeter soil columns. This was evaluated through unconfined compressive strength (UCS) and the calcium carbonate distribution over the length of the soil, finding that all methods generated a reliable increase in the strength of the soil specimen. This phase of research also included a batch study, evaluating the growth of the ureolytic bacteria *Sporosarcina pasteurii* in a solution composed of commercially available ingredients, showing that the bacteria could be cultured at a far lower cost (as low as 20 cents per liter) than with lab-grade ingredients (\$2.66 per liter).

The next series of tests compared the effect of applying treatment solutions to the soil surface directly and using a probe to inject solutions beneath the surface. This was done with 15-centimeter, cylindrical specimens, evaluated through the California bearing ratio (CBR) test. It was determined that the treatment process had the capacity to increase the CBR value substantially (from ~11% up to 188%), and it was suggested that each treatment mechanism resulted in a predictable distribution of calcium carbonate. There was also success in using alternative, commercially-sourced ingredients to facilitate the treatment and improve the CBR value.

The last tests centered on the treatment of a 30-centimeter-by-30-centimeter mock road section, combining the treatment mechanisms used at the 15-centimeter-scale to facilitate an increase in the CBR of a soil layer under pavement. Through UICP, the CBR value of this layer was successfully increased.”

