Foundation Design: Presumptive vs. Measured Strength of the Burlington Limestone Student: Matthew Martin

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Abstract:

Much of the campus of the University of Missouri is underlain by bedrock consisting of Burlington limestone. When new structures are built on campus, often the foundation of the structure must be set into bedrock, as it provides superior strength and stability versus foundations on soil. When designing deep foundations, the strength of the bedrock influences how robust the foundation must be. The weaker the bedrock, the larger and more expensive the foundation. Often, foundation designers will use an assumed, or presumptive, value of strength for the bedrock, rather than sample and test the rock. The presumptive value must be conservative (lower bound), and as a result, the foundation is likely to be overly robust and expensive. It is hypothesized that the use of presumptive rock strengths is resulting in overdesigning foundations on Burlington limestone and that costs of foundations can be reduced by sampling the rock, measuring the rock strength and using the measured strength for design. Twenty (20) tests on specimens of the Burlington limestone resulted in an average strength of 1300 ksf with a standard deviation of 550 ksf. If one uses a 270 ksf strength for design, there is a 1 in 10,000 chance that the actual strength will be less, and this design strength is more than six (6) times the presumptive value of 40 ksf. Over-designing new foundations on Mizzou's campus could be avoided by using measured strengths for the bedrock thus reducing the costs of foundations. Additional specimens of the bedrock must be tested to provide a robust database on the geologic variability of the Burlington formation and further ensure the safety of any future foundations for Mizzou buildings.