

Gateways

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Upcoming Continuing Education Opportunity!

June 6, 2011

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A sequel to last issue's
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IT'S YOUR TURN

Are you dealing with or have
questions about a geotechnical
issue? If so, send us an [email](#).

We'll get you
the solution!

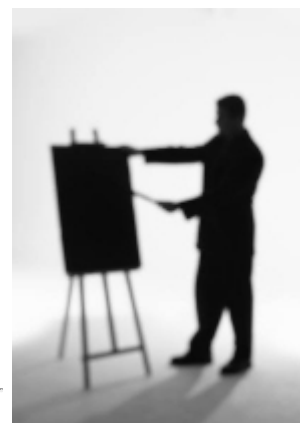
THE SEMINAR OF YOUR CHOICE!

Put **Monday, June 6 (9 a.m. through lunch)** on your calendar now and we will get the word out as to subject matter and other details. It will again be held at the Enterprise Bank conference facility on Lindbergh Boulevard in Sunset Hills.

Let us know what geotechnical issues you would like to learn more about or need help with on a recurring basis. Tell us what you would like. Right now the subject is:

"Requesting the Geotechnical Report and What Should I Expect It To Provide?"

For sure, the presentation will be applicable and beneficial to your daily work, and an opportunity for continuing education credits. More later. . .



FEATURE ARTICLE

How Deep Should the Borings Be?

Last issue we discussed how many borings were needed; this issue we'll kick around how deep they should be drilled. And the answer is "just deep enough." That's deep enough to address all of the project's design issues or, said a different way, "sufficiently deep to identify all pertinent materials." And, again, the following two questions need to be addressed:

What am I building?
Where am I building it?

For vertical construction such as buildings or industrial facilities, answers to the first question include the type of construction planned, whether or not there are below-grade levels, and the magnitude of the associated structural loadings. Special features such as elevator pits, detention basins, retaining walls, and slope stability need to be considered as well.

We can all readily agree that the borings should extend deeper than the lowest planned construction. One rule of thumb says to drill at least twice the maximum footing dimension below the planned bearing level, so that supporting materials throughout the depth of greatest influence are characterized. For slab-on-grade buildings with minimal cut and fill, and where the loadings are not great, say a one or two-story, wood-frame building, 15 feet may be enough. On the other hand, if the building has a below-grade (basement) level, a 15-foot boring would provide little to no information for the bearing materials – you'll need at least a 25 to 30-foot boring to obtain the same design information.

Addressing the second question should consider the local geology and anticipated subsurface conditions; and maybe the need for intermediate or deep foundations. If the loads are

relatively high or concentrated, such as for multi-story buildings, parking garages, or bridges; and/or the structure is located in an area of suspect support, the borings will likely have to be extended deeper - to depths of 40, 50, or more feet, or perhaps to bedrock (essentially zero to 100 feet or more in the St. Louis area). If there is a need to take advantage of the higher bearing values bedrock can provide, its coring may be required. Drilled piers in this area are typically designed for a bearing value of 20 kips per square foot (ksf) of end area at practical refusal (no rock coring required), up to a maximum of about 100 ksf for sound bedrock verified with coring.

Another reason for deeper borings is the development of an appropriate Seismic Site Class, which is based on the IBC code adopted by local jurisdictions. At least one boring needs to characterize the subsurface conditions down to 100 feet, or to a lesser depth which would define the assigned class. Usually, because of uniform deposits of soft materials or encountered bedrock, this can be accomplished after about 50 or 60 feet of drilling. Sometimes on smaller projects, clients view it economically advantageous to accept a less favorable class without implementing deeper drilling. To make the right decision, the geotechnical engineer needs to understand his client, and to be in close communication with his drillers as the exploration is progressing.

Many of the same considerations are applicable to horizontal construction. For utility lines, roadways, and other site development, borings need to penetrate the full depth of cut plus at least 5 feet; and in fill areas borings should extend to a depth at least equivalent to the height of fill plus the thickness of any soft or otherwise compressible materials encountered.

Again, what's right boils down to the geotechnical engineer's experience and judgment, the flexibility given to adjust the field exploration in progress, and ultimately the level of risk accepted or defined by the owner. **If in question, always drill a little deeper – the nominal extra cost of 5 or 10 more feet will keep you out of trouble more often than not.**

Did You Know?

Supporting the St. Louis Gateway Arch

Most residents of St. Louis are familiar with the story behind the design of the Gateway Arch and its construction using crawler derricks on each leg – especially the difficulties experienced during the placement of the keystone section (**click on the photo to see it happen**). But we don't necessarily think about its hidden foundations which consist of massive concrete with post-tensioned steel reinforcement. The foundations extend roughly 60 feet below the surface and 30 feet into bedrock, with 252 steel anchors extending 34 feet into the foundations to tie down each leg of the arch. Perhaps the best source of information relative to details of the Gateway Arch's construction is the collection of numerous articles at stlouisarch.blogspot.com.

Nearly all structures are seen from the ground up, leaving the work of geotechnical engineers hidden and forgotten. And unless there are unforeseen issues with their performance, that's the way we like to leave it.



Gateways Around Town
WIN a Borders' Gift Certificate!

Last issue's gate was the Gravois Road entrance to Grant's Farm. We had five winners who received a gift card to either Borders or Barnes and Noble. They were:

Dan Smith with Paul C. Rizzo Associates, Inc.

Mike Burkemper with St. Louis County Department of Public Works

Jim Quindry with Interface Construction Company

Kurt Krueger with Rataj-Krueger Architects, Inc.

Rich Musler with Musler Engineering Company

This issue's gate is local to the St. Louis region. Again we will award gift certificates to Barnes and Noble to at least the top three winners. **Email us your guess - Good Luck!!**



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