

# Gateways

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We are sincerely appreciative of your support, and wish you a thankful holiday season with family and friends.



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

We'll get you the solution!

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## HOW MANY BORINGS DO I NEED?

(adapted from an article originally appearing in *Gateways* in 2010)

The answer to this question is quite simply "all over the place." But to arrive at a site-specific answer, we'll ask the following questions.

What are you building? Where are you building it? Who are you building it for?

For vertical construction structures such as buildings or industrial facilities (as opposed to horizontal construction of levees, roadways, and utility lines, for example), the first question includes the footprint size and shape, structural loadings if available and special features, importance of the structure and budget constraints, and the desired performance of the completed project. Generally the larger and/or more irregular the footprint, the number of borings should be increased. Special features, such as elevator pits, may require additional borings. With increasing importance of the building and increasing budgets, additional borings may be included.

The second question includes the anticipated subsurface conditions – this is where your geotechnical engineer's experience and judgment come into play. If the subsurface conditions are anticipated to be relatively poor and variable, more borings should be drilled. Also, if you have any historical background on the site, that should be provided to us (such as fill that might have been placed and tested, or previous improvements that may have been removed).

The third question takes into account any specific requirements of the owner, or possibly the applicable building code or jurisdiction

where the project will be located.

There have been many “rules of thumb” for estimating the number of borings required. HUD has required one boring for every 2,500 square feet (footprint) for spread footing supported buildings and one boring for every 1,600 square feet for buildings on deep foundations – of course, you might not know which foundation type is more appropriate until after drilling the borings. And there is no indication as to required depth, so sometimes we have seen a lot of shallow and relatively useless borings proposed for these projects. Some of the “big box” stores have required borings on a 50-foot square grid in the building area – that’s a lot of drilling for a store with as much as an acre under roof – and on a 100-foot square grid for the parking/roadway area. For smaller buildings, some rely on one boring in each corner and maybe a fifth in the center of the building area, or similar coverage.

If we are free to determine the number of borings we usually start with one boring for about every 5,000 square feet of planned footprint, and spaced no more than 80 to 100 feet apart in any direction. The borings should essentially encompass the entire building area so as to eliminate the need to extrapolate subsurface information; and typically a minimum of two or three borings per site, unless the planned project is very small. For larger manufacturing or warehouse buildings, we can usually reduce the number of borings, maybe to one every 6,000 to 8,000 square feet, especially if we expect relatively uniform subsurface conditions - all tempered by our past work in the area.

Many of the same considerations are applicable to horizontal construction. Depending on the complexity of the project, one boring every 300 to 500 feet may be adequate, depending on the variability of the subsurface soils. Additional borings are required at specific features such as major culvert crossings, and maybe as required to define the subsurface conditions along a cross section. State Departments of Transportation may require borings as close as 100-foot spacing along roadways and ramps; and, of course, at least one boring for every abutment and pier unit for bridges.

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. Typically, more borings result in better recommendations, smoother construction, and reduced life-cycle cost; all with relatively little cost for the additional exploration.

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## **FACTS ABOUT THE JEFFERSON MEMORIAL (NOW MISSOURI HISTORY MUSEUM)**

The Missouri Historical Society was formed in 1866, forming the roots for the Memorial, and being instrumental in securing the 1904 St. Louis World’s Fair.

The original Jefferson Memorial building was built with proceeds from the Fair, and is located on the site of the Fair’s main entrance.

Construction began in 1911 and the Memorial opened to the public on April 30, 1913.

The Memorial was the first national monument to Thomas Jefferson, preceding the Jefferson Memorial in Washington D.C. by 25+ years.



Thomas Jefferson's statue at the Memorial, created by Karl Bitter, chief sculptor of the 1904 World's Fair, was carved from a 40-ton block of marble and sits atop a polished granite pedestal.

Source: MissouriHistoryMuseum, mohistory.org.

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## WORLD'S LONGEST PALINDROME?

A palindrome is a word, number, etc. that reads the same frontwards or backwards, such as "madam" or "race car." What's the longest one you can come up with? Is it longer than the following:

"Go hang a salami, I'm a lasagna hog"

Source: Unknown

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## WINNERS OF LAST ISSUE'S "WHAT IS IT?"

The winner, literally within minutes of *Gateways* issuing the challenge, was Steve Skasick with EDM, Incorporated with his answer "A closeup of high plastic clay, after a scraper passed by?" Close enough to the exposed shale in an excavation at one of our projects in St. Louis County.

Others who responded within a short time were Gary Dedeke with Archimages, Inc.; Rick Mortensen with Mortensen Engineering, Inc.; and Dan Smith with Paul C. Rizzo Associates, Inc.

We especially liked the following descriptive response, "When you lift up the mud tub after drilling and drag it over the dumped out cuttings."

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**Gateways** is published by:

Gateway Geotechnical, LLC  
17736 Edison Avenue  
Chesterfield, Missouri 63005  
Telephone: 636-532-7747  
Fax: 636-537-0090  
[www.GatewayGeotechnical.com](http://www.GatewayGeotechnical.com)

Send comments/suggestions to:  
[info@GatewayGeotechnical.com](mailto:info@GatewayGeotechnical.com)

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