

LINEBERGER CONSULTING ENGINEERS, INC.

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Residential Slab-on-Grade Foundation Systems Bearing on Plastic Clay Soils

1. If you suspect a plumbing leak, get your house plumbing system statically tested and repaired as needed. Assure your drain system (and domestic water supply, irrigation system, etc.) is leak free. Should plumbing leaks be present, get a flow test done to determine the leak discharge water volume.
2. Check your foundation drainage. Assure that the surface water drains away from the foundation along its perimeter, and no low areas allow water to pond for longer than a day or so after a heavy rain.
3. Understand how your foundation system works. The basic purpose of your house foundation system is to safely separate habitable areas from the exterior environment and limit damage or distress to interior/exterior brittle building materials. One of the crucial underlying design principles of shallow bearing slab on grade foundation systems is its “single unit” behavior. To do their job, slab-on-grade foundation systems act as single structural elements with uniform stiffness. These foundation systems are designed to respond uniformly to resist upward or downward movement caused by soil pressure from below, and heavy structural loads from above. In doing so, these slab-on-grade foundation systems are stiff enough to buffer potentially damaging soil and subgrade material movement, yet flexible enough to protect the supported structural elements from unsafe or excessive planar tilting.
4. Know the limitations of your foundation system. The weight of your house walls, roof, appliances, furniture, or perhaps fireplace stone or brick are compressive loads that act downward on top of your foundation floor. These compressive loads average perhaps 300-500 pounds per square foot. Conversely, soil pressure acts upward from beneath your foundation system. Soil pressures average perhaps 3000-5000 pounds per square foot and pose a greater damage threat to your foundation system than do compressive loads.
5. Understand your local soil conditions. Sand is non-plastic and quite stable. Clay is plastic and subject to volumetric changes with the addition or removal of moisture. When water is added to clay soil it expands, and when water is removed from the same soil, it shrinks. As previously mentioned, expanding clay can produce tons per square foot of pressure on the underside of the foundation system, while the weight of a typical house produces less than 500 pounds per square foot average along its perimeter. With that said, excessive water input to clay soil poses the greatest threat to lightly loaded, shallow clay bearing foundations systems.
6. Get an independent engineer to evaluate your foundation. A competent structural engineer can provide an unbiased opinion and technical guidance based upon what the structural status of your foundation system. If your foundation system is structurally sound, then it is likely that structural stabilization using underpinning systems will not be needed. If the engineer finds that your foundation is not structurally sound, then the proper repair will likely require stabilization such as underpinning.