



Get Smart About Soil

You can build—or buy—a home with confidence once you know about the ground it rests in. Forget the topsoil. Concentrate on the earth 10 to 20 feet down; that's the key to a home's stability **By Denise Gee**

MOST HOMEOWNERS don't understand the importance of their soil until it's too late, when their house has settled—and irreparable damage may have been done—because the foundation proved no match for the earth it rests in. Even million-dollar properties have been known to suffer this fate, when irresponsible developers use filler soil, padded with trees and other organic matter that decomposes and collapses, damaging the house in the process.

So how can you tell if your dirt has integrity? We talked with an expert in the field, geo-technical engineer Michael W. Laney of California. "You can't control what soil is under your house, but you can control risk," Laney says. Here are some suggestions how to do just that.

Danger Signs Be aware of an obviously re-graded site (your property is three feet higher than surrounding sites, say, or if it looks like the builder took off the top of a hill to build), which can result in unstable soil. And a steep slope behind a home site might mean poorly compacted earth, making the house prone to land slides. Beware of soft spots, which could indicate

DO YOUR RESEARCH

Government agencies, university engineering or geology schools and websites (USDA.gov or sis.agr.gc.ca/cansis) can provide topographic maps and/or soil surveys. Use them to help you understand the basics about the your soil.

If you have any concerns, hire a geo-technical engineer to conduct an in-depth report. The engineer will do soil samples and borings (earth obtained by boring a vertical hole deep in the ground) and analyze them for makeup, drainage, structural weight-bearing integrity and settling or shifting potential. A soil report also details groundwater conditions and recommends an ideal foundation as well as ground stabilization techniques (i.e., soil treatment and/or retaining walls) in order for a builder to know what kind of structure the land can safely support. Commercial property developers always hire geo-technical engineers, but residential developers and remodeling contractors may not in order to cut costs.

Before hiring your expert, check out his or her references. Ask to see previous copies of their reports to gauge their attention to detail. Accompany them during their inspection to see what they actually look at, and feel free to ask questions.



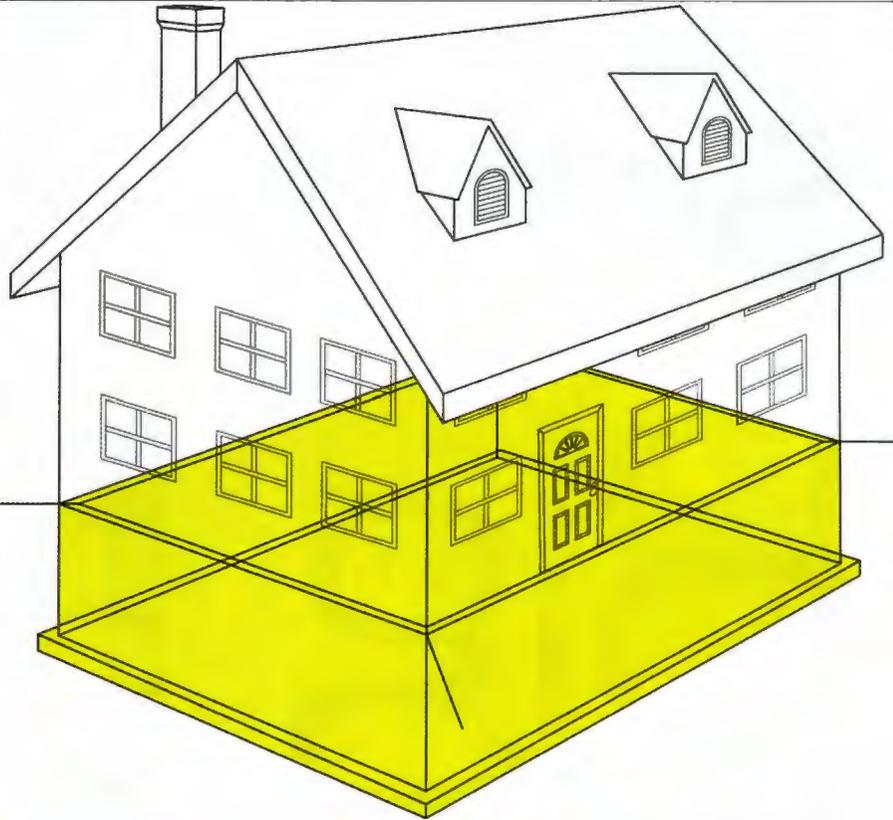
a leakage/groundwater problem.

If you're looking to buy, watch out for sellers who attempt to camouflage soil problems to ensure a smooth sale. Potential trouble signs include visible cracks in the foundation, floors that aren't level or pooling of water around the house. Water damage in the basement could mean groundwater problems, and cracks around windows and doors might be a result of swelling clay soil, slope movement and substantial settling. Contact a geo-technical engineer to address any concerns. You can always negotiate the cost of report (\$3,000 to more than \$10,000, depending on a site's complexity) by asking the seller to pay or splitting the cost.

On Good Footing When you're building atop low quality or disturbed (non-compacted) soil, be sure your builder uses wide steel-reinforced concrete footings and, for added strength, steel, wood and/or concrete vertical piers. Concrete footers are often 20 to 30 inches wide and at least 8 to 16 inches thick. The reinforced steel will increase the footer's strength should the ground move. Piers help concentrate even more of the weight farther down into firmer soil or bedrock. These can be a big help in areas prone to landslides, sinkholes and frost heave. "You can never reduce a home's settling," the geo-technical engineer Laney says, "but with good support it should be negligible." **Worst Case Scenarios** So what do you do if you believe your home is settling—badly? One option: Spend up to \$30,000 to drill holes in the foundation's slab and pump concrete in to add support. But before you do, get a engineer's report to evaluate the severity of the situation.

If you suspect that your home might be constructed atop an old gas station or dry cleaner, (fumes are a good indication), you may be dealing with contaminated soil. It's your responsibility to clean it up, unfortunately, and you'll need to hire an environmental engineer to do so.

Your best bet? Get smart about your soil before you build. "It's the best insurance policy you can have," Laney says.



THE DIRT ON DIRT

Here are the basic soil types that Laney calls "the primary colors." Most dirt, however, is a blend of one or more of these, creating distinct challenges. An ideal soil is granular with little clay content. Silty sand is the best; it's primarily sand, but has 35 to 49 percent silt in it.

Bedrock: All soils are the result of an erosion of bedrock materials. Bottom line: This is the best material to build on, but it still requires evaluation by a geologist or engineer, since it can sometimes have innate characteris-

tics that make it less appealing for foundations or slope stability. It also can have poor drainage.

Sand: Coarse-grained soil. Bottom Line: Provides excellent drainage, bearing and compaction abilities. However, in a loose state it can settle under an applied load or, if loose under the groundwater table, can liquefy during earthquakes.

Silts: Fine-grained but with low to moderate permeability; it can sometimes expand when wet. Bottom line: Silt has excellent compaction potential, but can be

prone to erosion when dry and exposed to rain and wind.

Gravel: Made up of small stones, it has high permeability and excellent drainage capabilities. Bottom line: It's not good foundation bearing material due to abundant voids between the stones.

Clay: Very fine-grained soil with low permeability and the potential for expansion when wet. Bottom line: This is the least desirable foundation soil. It is difficult to compact, and has the strongest potential to settle when placed under a load.



Any soil near a home that's dug up, say, by a utility worker or a plumbing contractor—and not properly compacted upon its return—can result in exterior-wall settling and the cracking of drain lines.