

When there is physical contact between a tree and a foundation, the damage, if any, may vary greatly according to the species of tree, the site conditions, proximity to the foundation, the type of foundation, the portion of the tree contacting the foundation, and the tree's size. The tree species is important because a larger, older, longer-lived, shade tree is a greater concern than a smaller, younger, shorter-lived ornamental tree or shrub.

This is due in part to the extent of the root system involved with shade trees. Most trees have root systems contained within the top 4 to 5 feet of soil, with the absorbing roots in the top 12 inches. The roots can extend outward beyond three times the height of the tree. Thus, a tree with a height of 50 feet, could have roots that grow outward 150 feet from the trunk. If your tree has limbs near your house, you are likely to have roots growing under or along your foundation. If you do not water around the foundation, research shows that roots will have a tendency to congregate and develop more rapidly under the foundation simply because of the increased amount of available moisture underneath.

The type of foundation is important because, as a general rule, a pier-and-beam foundation can tolerate nearby trees better than a slab. To understand why, consider the portions of the tree that contact the foundation and the forces exerted. A root, root crown, or root flare running under a foundation can exert an upward pressure as the contacting portion expands in diameter. The root, root crown, root flare, or trunk, can also exert an inward pressure if they contact the outer perimeter of the foundation as they expand in diameter. Since a pier-and-beam foundation gains its support from piers rather than just concrete on top of soil, they can more readily sustain minor pressure from nearby trees. If a large shade tree is 5 feet from a foundation, physical contact and pressure exerted against the foundation is likely. If the tree is 15 feet away, physical contact is likely and pressure exerted against the foundation is possible. If the tree is 30 feet away, physical contact is still possible, but not as likely to exert much pressure against the foundation.

Trees can affect the moisture content of soil under and around foundations. A large shade tree can transpire as much as 200 gallons of water per day. Trees "transpire" or release water into the air in the form of

vapor. The water for transpiration must come from the soil by way of the roots. This is why trees are known to "pull" water from under a foundation, but only when water in the surrounding soil is inadequate or unavailable. Since water naturally moves through the soil from high moisture areas to low moisture areas, simply not watering at all can cause foundation problems regardless of nearby trees. Trees can add to the problem but are usually not the primary cause of moisture loss from soil.

When trees have died or have been removed, the roots that remain under or near a foundation can create problems. As the root system begins to rot and decay, air spaces and gaps occur in the soil to replace the roots. This results in a soil that can shift to fill the void. Many years ago, foundation professionals would see a larger shade tree that is close to the house and automatically recommend removal. Today, research shows that removal of the tree is not always the answer. Since many trees and foundations have existed together for many years, any changes that occur do so over time and they can be minor, compared to the removal of the tree. If a large shade tree, that is close to a foundation is removed, more dramatic changes can occur to the soil and foundation than if the tree was left alone, in most cases. Consideration must be given to the full, longterm effect of removing an existing tree near a foundation.

In Conclusion

When a foundation has a deficiency, many issues must be considered. Seldom is a tree solely at fault. Cautiously consider any recommendation to remove a tree as the answer to foundation failure. In some cases, a tree will offer benefits that help offset any foundation concerns such as the energy savings obtained or any of the many other benefits of trees. Obtain other opinions from numerous consultants in relative fields.

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TREES, FOUNDATIONS, AND SOILS



Foundation problems, or structural deficiencies of homes and buildings are a common concern in North Texas. Structural engineers and foundation experts state that there are two types of foundation owners, those who have had foundation problems and those who will. With an increasing number of area foundations being poured and the increasing age of existing area foundations, a rise in future deficiencies will likely occur. There are many potential reasons for foundation problems, and the causes may vary greatly from site to site. The soil in your neighborhood may be one type, but area-wide the soil types could include clay, sand, sandy loam, rock, or a combination of these materials. Soil diversity can result in a large local plant palette, which is great for plant enthusiasts but not always great for foundations. Due to the variance of soil types and conditions at any single site, it is not possible to offer any one response to a problem. The subject of foundation deficiencies is broad, and it requires different areas of expertise. Experts can include Soil Scientists, foundation repair

companies, Hydrologists, Structural Engineers and Consulting Arborists. Gathering input from each specialist is wise but it can lead to differences of opinion and confusion. In some cases, the professional opinions may be based on conflicting or outdated research. Deciding which remedy is best suited to a specific circumstance is sometimes a difficult task.

When trees are growing close to a foundation the opinion of a Consulting Arborist is often requested. Many times, trees are identified as the cause of foundation deficiencies by one or more consulting professionals, and removal of the plant is recommended. Consulting Arborists usually have a basic knowledge of other professional fields, and vice versa. A Consulting Arborist will offer what he knows to be a fact, but at some point, advice or recommendations become a professional opinion based on experience, common sense, and research. The Consulting Arborist's objective is to teach the property owner how the trees might affect foundations. Sometimes this requires a discussion directed more toward the "whole picture". By examining all of the related issues, arborists, foundation experts, and others can determine if trees are a problem or a contributor to a problem. The issues are not always black and white. However, being informed and knowing what to ask, can lead to the correct solution. A list of questions to ask or issues to consider would include the following:

Site Planning and Development

Consider the planning and development and the history of the site beginning as far back in time as records will allow. Determine what existed on the site before it was developed. Check for records available from city hall, the builder/developer or others that may have been involved with the site. In many housing developments, the site is graded and leveled, removing or redistributing the topsoil (the good stuff for growing plants!). Determine if your site has any topsoil remaining. If so, measure the depth. Determine whether the soil type and soil profile were taken into account in planning and developing the area, or in the design of the foundation. Determine if the builder made adjustments to the soil profile before pouring the foundation. and if so, was the soil compacted to industry standards? Experts agree that these practices directly affect the integrity and life expectancy of a

foundation BEFORE being installed. North Texas property owners who have researched their property's development have sometimes found that the property was a construction debris dumpsite, a filled floodplain, or a covered natural spring. Poor site planning and development can lead to foundation problems.

Soils

Soils are often noted by the experts as the primary factor in foundation problems. Do you know the soil type that exists under the foundation? Is there rock underneath? If so, what type of rock? Is it fractured and mixed with soil, or is it a solid layer and to what depth? If the soil is black clay, the high shrink/swell potential can be a factor. The black clay soil in our area shrinks when it is dry, and expands when it is wet. Sandy soils shrink and swell a smaller amount and do not retain water like clay soils. When a foundation site contains a mixture of clay, sand, sandy loam, or rock, it becomes more difficult to predict how the soil will react. Most soil types, and soil mixes can adequately support a foundation if they are properly planned, designed, built, and MAINTAINED! Even the best foundation, built under ideal conditions, can have difficulty if it is not properly maintained.

Lot Completion

Consider the final lot grading. Does your lot drain correctly? Does water stand near your foundation, or does it drain away? Is the soil level below the bottom of the foundation or above the brick or exterior material? Proper drainage and final grading near a foundation are important in avoiding future problems.

Life Expectancy

Consider the type of foundation, its design and the site conditions. Was it designed to last forever? Many people believe that since it is concrete, a foundation should last forever. Almost everything has a life expectancy, including concrete. Our area has foundations that are fifty years old or more with few problems and some with problems only a few years after construction.

Quality, Standards, and Workmanship

Quality issues apply to every person involved in the construction process from the builder/developer to the structural engineer and even the city officials that inspect and approve of the construction practices. Poor workmanship or inattention to the circumstances

by any person or group that is involved must be investigated. Foundation experts, structural engineers, and others can provide their recommendations, but be aware that a conflict of interest may exist. An un-biased opinion of the standards utilized and the quality of construction on a project is crucial. Since many experts in different professions may also work for others in related fields, it is wise to ask if the person or company has had any relationship with others involved, or to hire firms from outside our area.

Proper Watering

The goal of watering a foundation is to provide adequate and consistent soil moisture under and around a foundation at all times throughout the year. Under-watering or over-watering for any length of time can cause problems, regardless of the soil type. Since North Central Texas has experienced drought conditions in previous years, many homeowners who did not adequately water may now have foundation issues.

Foundation Types

Conceptually, a slab foundation is basically a "slab" of reinforced concrete poured on top of the soil. A pier-and-beam foundation contains "piers", or pillars, of reinforced concrete with beams of various materials stretched across the top of the piers (normally a beam of iron and/or concrete). A slab foundation is more readily affected by the soil under and around it as well as the soil moisture content. A pier-and-beam foundation is slightly less affected by soil type and moisture content, especially if the piers are resting on top of a rock layer. There are other foundation types, but the important question to ask is: "What type of foundation has been installed and is it suitable to the site conditions?"

Trees

Trees can cause problems for nearby foundations in three primary ways.

1. By physical contact with the foundation
2. By affecting the moisture content of the soil under or near a foundation
3. By causing air gaps and shifting soil due to decaying roots under or near a foundation (when a tree dies or is removed)