GOOD NEWS – BUT NOT ALWAYS

The prospective homebuyer and homeowner in the Amarillo area are indeed fortunate. Typically, he has a wide choice of type home, size, and location for wide ranges of pricing. The region boasts a cadre of competent and caring homebuilding community that believe that quality home construction is the key to a healthy and durable home building climate in the region. In the majority of cases, the homebuyer can expect to receive a high quality product for a reasonable price.

Minority of cases do occur when the homeowner's expectations are not, unfortunately, satisfied. A small percentage of both new and used homes do exist that have deficiencies. A builder may provide one hundred homes that exhibit no structural problems. But if he produces one home that does have apparent structural deficiencies out of those one hundred, then he will spend more time and energy in callbacks and even possibly litigation than all the other successful units combined. Life's too short to be forced to deal with structural deficiencies in home construction, particularly when difficulties and risk can be avoided or averted at very small relative cost.

Construction related deficiencies do occur in residential structures in the Amarillo area. Our engineering staff here at Amarillo Testing and Engineering, Inc. provides structural forensic services to a variety of clients such as home builders, home owners, insurance companies, real estate companies, and litigants in the local area who seek remedies or compensation for those deficiencies.

Consequentially, we have access to a considerable bank of knowledge and experience regarding those deficiencies, their origin, and sometimes their remediation. In the process, we have insights that we seek to share with interested parties that may serve to help prevent the more common repeated deficiencies regarding home construction in the Amarillo area. The following is a summary of reoccurring circumstances and defects (not necessarily in order of importance or predominance) that originate with original construction:

Common Problems Encountered in Slab on Grade Residential Structures

1. Excessive landscape watering results in perimeter uplift due to expansive clays. Soils beneath the perimeter foundation become wetted, swell, and cause uplift of the exterior walls and adjacent floor slabs. This makes the interior slab near the center of the house to appear as if it has "settled". Doorjambs become misaligned and cracks occur over doors and windows in the dry wall.

2. Sporadic or inconsistent landscape watering can result in seasonal shrinkage and/or uplift in the exterior walls and adjacent floor slabs. Expansive soils beneath the footings can be wetted during wet seasons to cause uplift, but then can settle back during the dry season as shrinkage of the perimeter soils occur.

3. Poor or negative drainage around the exterior of the house can result in excessive, but intermittent wetting and it's resultant uplift of perimeter foundation features.

4. The floor is often too close to the same elevation of the exterior landscaping. City code calls for at least six inches vertical separation between wood structure and the ground level. Two to four inches is the actual separation more often than not.

5. Cracks in walls and variations of floor levelness concentrate in areas radiating from fireplaces and basements.

6. Mortar in brick veneer deteriorates prematurely near the brick veneer's ground level.

7. Exterior concrete flat work's surface deteriorates and cracks prematurely.

   Excessive cracking in interior slab concrete.

8. Plumbing deficiencies occurring soon after construction is completed. Fresh water lines leak and sewers do not drain or become plugged too frequently.

9. Seepage in basements.

10. Excessive cracking and shifting of retaining walls.

A common response to the above problems will be, "If you're going to own a home in Amarillo, Texas, plan on having at least some of the above noted defects." This is a true comment, almost common knowledge. The thing is, though, many of these circumstances can, for the most part, be prevented. What's more, the cost of prevention is surprisingly lower than might be expected.

Most homebuyers are concerned with initial cost, but they can be quality conscious if they become aware of the cost of not having the highest viable quality. As the old saying goes, “One keeps paying for low quality long after the cost of high quality has been forgotten.”

The above noted deficiencies are all rooted in the structural components of the residence. The source of difficulty can be traced to either the site preparation, the installation and/or design of the foundation and/or structural framing system. Interestingly, the typical homebuyer does not usually concern himself with these aspects of the construction work until he experiences one or more of these noted defects. This means the building professional must concern himself with these details for the sake of the prospective homebuyer and make the homebuyer aware of the methods of prevention.

Source of Deficiencies

The above noted defects typically encountered are usually not the result of any one source. As stated, the origin of the deficiencies stems from site preparation and or design/construction of foundation and structural systems. Usually, the defects occur as a result of combinations of problems with these aspects of the constructed feature.

Never the less, each cause must be described separately while the reader is asked to keep in mind that the encountered problems usually involve combinations of the noted cause to follow.

Site Preparation

Unprepared Sites -- Even a highly engineered and heavily designed residential foundation system can exhibit problems if site preparation is inadequate. Proper site preparation prior to the first load of concrete cannot be overemphasized. Regardless of the client’s willingness to pay, proper site preparation must be a builder’s first priority for his own protection.

Few residential structures exhibit catastrophic foundation defects. But when such defects occur, it’s usually the result of a site that is not conducive to supporting a building foundation. Some of these problem sites are natural and some are manmade.

Most of the serious problems observed in the Amarillo area stem from the placement of a structure on uncontrolled embankment fill soil. The City Code permitting process does not become involved until the homebuilder files for a building permit for a particular piece of property. Unless the builder is aware, he may be planning to build on a site that has received uncontrolled fill. The City becomes involved with compacted fill after the building permit has been filed. It is assumed that the site is adequate for construction prior to the filing of the building permit. Unfortunately, ample evidence exists that the site often is not in a condition conducive for building without additional site preparation.

A similar circumstance exists on sites that are not to receive embankment construction fill; or the structure is to be built on a site that has been scalped of vegetation and footings are cut without additional modification. Typical clayey soils in the Amarillo area are dry and hard, at least during a dry season. Unfortunately, soils in this condition are prone to swell when wetted. So when the home is completed and the sprinklers are turned on, uplift actions around the perimeter of the house begin immediately.

Prepared Sites – Sites that are prepared with additional embankment fill soil in accordance with minimum City Code Enforcement Standards are still prone to post construction soil movements. The City's standards are prepared as a minimum requirement for permitting. However, experience indicates this requirement is only adequate at best, designed to keep general home construction costs as low as possible while providing some enforcement capability.

No standards or guidelines are dictated by city code with regard to the type of embankment soil that is to be used for site leveling. As a result, a clean sand soil could be used for embankment fill over a site of heavy expansive clays that are impermeable. Sands on the surface can absorb moisture and hold moisture on top of underlying clays. This can create a sub-surface pool of water around the house! Not good. On the other hand, a heavy clay that has high expansive soil qualities can be placed on a good clayey sand site that would have been very good for construction otherwise! Not good, either.

Foundation/Structural Design

City code requires a perimeter grade beam of 2' depth by 10" width with longitudinal reinforcing steel for single story residential units with interior 3 ½" slab with wire mesh over sand layer without regard for interior structural support footings or slab thickenings. Such a system is marginally adequate for about a 1200 sq.ft. rectangular residential structure as long as no site preparation defects exist. It's a bare minimum. And yet, large 3500 sq.ft., heavy stone homes with multiple interior and exterior corners are built with this foundation system. What's more, the modern trends call for large open spaces. This means structural loadings must be concentrated on an unsupported slab.

On top of all this, framing is often performed without plan, guidance or proper consideration for framing span requirements. Thank goodness most framers are capable of dealing with these situations adequately in most cases. Unfortunately, oftentimes the framer is forced into uneven load distributions for which he has no control.

The end result is high structural loadings at specific interior slab locations where no additional foundation support is anticipated. When the exterior soils act to uplift the perimeter of the house, the heavily loaded slab has a tendency to settle in a see-saw action. This aggravates the differential movement of the floor slab when the wetted expansive perimeter soils swell and uplift.

Similar differential movements are observed around fireplace locations and basement locations. Sometimes, it appears that the fireplace or basement has settled with respect to the rest of the house. The basement or fireplace acts as an anchor that is essentially immovable. Yet, the surrounding perimeter of the house can uplift. As a result, cracks and damage radiate around the fireplace and basement as uplifting of expansive soils occur. All the problems that occur as a result of improper site preparation aggravate whenever basements and heavy fireplace structures are involved.

Installment Deficiencies

Unfortunately, damage investigations sometimes reveal poor craftsmanship of installation. A common example of such inadequacies is finding wire mesh or slab reinforcing steel at the bottom of the slab, partially immersed in the underlying sand layer. These investigations are often initiated by discoveries of fresh water leaks beneath the floor slab. Want to guess why the leak occurred? It occurred because the un-embedded slab reinforcing steel has rubbed upon the unburied fresh water line!

Sewers tend to plug more frequently when the fall of the line is not maintained. Not enough care in installation is the culprit.

On some houses, the mortar of the brick veneer recedes. This is seen within about three feet of the surface of the ground. Poor mortar is discovered at these locations. Poor mortar ravels due to the sprinkler water, which should not hit the wall in the first place, but it sometimes does due to inattention of installation.

Seepage around basement or subsurface walls can sometimes be a problem. As long as the basement is constructed wholly on the interior of the residence, no exterior water seepage is probable unless a plumbing leak occurs. Usually, seepage from exterior wetting occurs along basement walls that are coincident to outside perimeter walls. Water will accumulate below the surface if the soil adjacent to the outside wall is loose sand or un-compacted clay. Proper attention to compaction with proper soils and possibly installation of French drains could have prevented this situation.

Some building sites require retaining walls. To be adequately designed, retaining walls must have a sound spread footing below the surface with heavily reinforced walls. Most people do not understand the terrible force soils can exert on a manmade structure. A properly designed retaining wall is typically much more expensive that the layman would normally anticipate. Consequentially, many retaining walls are constructed of marginal design for the intended purpose. Substandard performance may or may not occur, depending on weather and site conditions.

Landscaping

Sometimes, landscaping can aggravate foundation movement problems. First of all, poor landscape maintenance can cause stress even in the most well built homes. The cycles of wetting and drying due to seasonal changes cause the foundation soils to swell and shrink, respectively. Poor landscape maintenance leaves the foundation soils around the perimeter of the house vulnerable to erratic changes in the soil moisture content. Conversely, overwatering keeps adding moisture to the soils surrounding the house, which can result in continuing uplift.

On the other hand, consistent but moderate landscape watering will keep the perimeter soils at a stable moisture conditions. This should help minimize the cyclic variations in the foundation movement.

The layout of landscaping can exert negative influence. The presence of large, moisture sapping trees near exterior walls can cause localized shrinkage of the soil. What's more, large roots can take hold adjacent to the foundation. If a wet season ensues, the roots will grow in the vicinity of the foundation where water tends to gather.