HOMEBUYERS' GUIDE

FOR

FOUNDATION EVALUATION

by
The Structural Committee

of
The Foundation Performance Association

www.foundationperformance.org

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PREFACE

This document was written by the Structural Committee and has been peer reviewed by the Foundation Performance Association (FPA). This document is published as FPA-SC-06 Revision 0 and is made freely available to the public at www.foundationperformance.org so all may have access to the information. To ensure this document remains as current as possible, it may be periodically updated under the same document number but with higher revision numbers such at 1, 2, etc.

The Structural Committee is a permanent committee of the Foundation Performance Association. At the time of writing this document, Ron Kelm, P.E., chaired the Structural Committee and 20 to 30 members were active on the committee. The committee sanctioned this paper in November 2002 and formed an ad hoc subcommittee to write the document. The subcommittee chair and members are listed on the cover sheet of this document. Members of the FPA Structural Committee regularly practice in the design and / or performance evaluation of residential foundations and their contact information may be found on the FPA web page www.foundationperformance.org.

Suggestions for improvement of this document should be directed to the current chair of the Structural Committee. If sufficient comments are received to warrant a revision, the committee will form a new subcommittee to revise this document. If the revised document successfully passes FPA peer review, it will be published on the FPA website and the previous revision will be removed.

The intended audiences for the use of this document include buyers of homes and low-rise buildings, lenders, realtors, landscape contractors and landscape architects, real estate investors and other interested parties. While this document specifically discusses home buying, it may also be applicable to the purchase of other low-rise structures with similar foundations.

This document was written specifically for use with building sites that are located in the southeast region of the state of Texas, and primarily within the greater Houston area. This document should be used with caution if applied to other geographical areas.

This document was created with generously donated time in an effort to improve the performance of foundations. The Foundation Performance Association and its members make no warranty, expressed or implied, regarding the accuracy of the information contained herein and will not be liable for any damages, including consequential damages, resulting from the use of this document. Each project should be investigated for its individual characteristics to permit appropriate application of the material contained herein.

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1.0 INTRODUCTION

The large number of residential foundation problems in southeast Texas prompted the call for this document. The typical buyer is inexperienced in evaluating and understanding a foundation's performance for either new or resale homes. The economic implications of purchasing a home with an inadequately performing foundation can be significant.

The purpose of this document is to help prepare buyers in understanding the condition of a foundation so that a more informed buying decision can be made. This paper should not be construed as a substitute for an inspection performed by a qualified, State licensed inspecting professional.

This document was written by a group of engineers and other professionals who regularly design or evaluate foundations, and is freely available to the public through the Foundation Performance Association at www.foundationperformance.org.

This paper provides the homebuyer with:

- a list of appropriate foundation-related questions to ask
- a cursory guide for looking at a house with an informed view for evidence of foundation-related problems,
- documents to ask for prior to purchase of a house,
- comments on finding a qualified Professional Engineer (P.E.) and/or Licensed Real Estate Inspector,
- a glossary of terms used in this paper.

For initial foundation inspection and ongoing foundation maintenance checklists, the homebuyer may refer to document FPA-SC-07, *Foundation Maintenance and Inspection Guide for Residential and Other Low-Rise Buildings*. Another helpful document is FPA-SC-03, *Distress Phenomena Mistakenly Attributed to Foundation Movement.*

2.0 GLOSSARY

For the purpose of this paper, the following terms are defined:

Brick Veneer: Non-structural wall covering formed from bricks and mortar. Other common exterior finishes include siding, plaster (stucco), and stone.

Crawl Space: A space between the structural floor and underlying soil large enough for an adult person to access.

Differential Elevation: Vertical elevation difference of one area of a foundation relative to other areas, typically measured in inches.

Differential Movement (Foundation Movement): A change in position of a foundation system that is detectable by changes in elevation and may be accompanied by visible signs of distress.

Distress: Cracks or separations in drywall, exterior veneer, foundations, grade beams and trim, door and window misalignments, and noticeable distortion in framing. These are some of the more common forms of distress that occur in a residential structure subjected to differential movement. Also referred to as negative phenomena.

Drywall: Gypsum sheets used to cover walls and ceilings, commonly called sheetrock.

Elevation: A vertical distance above or below a point of reference.

Existing Homes: Homes that are pre-owned or which were newly built but not occupied for a period of approximately one or more years after completion of the home.

Expansive Clay: Clay that exhibits a volume change when dried or wetted.

Foundation: That part of a building located between the superstructure and soil that transfers load between the superstructure and soil.

New Homes: Homes that are typically less than one year old and have not been previously occupied.

Piers: The reinforced concrete component of a deeply supported foundation that may have a straight or underreamed shaft, which transfers the building loads between the foundation and deeper soils. Also called piles, caissons, drilled shafts or drilled piers.

Plasticity Index (PI): A scale used to measure the potential for volume change for expansive clays. Clayey soils with a PI less than 15 percent are considered non-expansive, clayey soils

with a PI between 15 and 25 percent are considered to be moderately expansive, and clayey soils with a PI above 26 percent is considered highly expansive.

Professional Engineer (P.E.): Under current Texas law, a licensed Professional Engineer will have met certain educational and professional standards. Refer to the website of the Texas State Board of Professional Engineers (TBPE) at www.tbpe.org for more information. By Texas law, only a licensed professional engineer is allowed to represent himself as a Professional Engineer and use the title, "P.E." after his name.

Slope: Ratio of height to distance. As an example, a 3-foot drop over 100 feet is a slope of 3 percent (3%). Often used in reference to drainage.

Superstructure: That part of a building that is above and supported by the foundation.

Settling: Downward foundation movement.

Real Estate Inspector: An inspector licensed by the state of Texas under authority of the Texas Real Estate Commission (TREC)

Uplift: Upward movement of the foundation, also called heave.

3.0 BUYER INSPECTION OF NEWLY CONSTRUCTED HOMES

Prior to purchasing a newly constructed home, a buyer may perform some general inspections using the following as a guide. Some important questions to ask the seller are:

- ❏ Ask if there are any written inspection reports from either a Licensed Real Estate Inspector or a professional engineer. The Seller's Disclosure Notice (taken from Texas Association of Realtors, Inc., #TAR-1406, 4-26-04) signed by the seller states: "Within the last 4 years, have you (Seller) received any written inspection reports from persons who regularly provide inspections and who are either licensed as inspectors or otherwise permitted by law to perform inspections? Yes __ No ___ If yes, attach copies and complete the following:
  - Inspection Date_____
  - Type_____
  - Name of Inspector_____
  - No. of Pages_____"

- ❏ Observe the ground slopes in the vicinity of the foundation. It should clearly slope away from the foundation on all sides. Ground sloping toward the foundation usually is a source of problems

- ❏ Note the location of all drains and downspouts. Downspouts should discharge away from the foundation, into an underground drainage system, onto sloped paving, or onto

splash blocks sloping away from the house. If downspouts connect to a drain, determine the location of the discharge to ensure the drain is functioning.

- ❏ Ask "What type of foundation does this house have?" Ask if there are Inspection Reports of the Foundation installation by a P.E. The typical foundation types in southeast Texas are 1) slab-on-grade with steel reinforcing bars (rebar), 2) "Post Tensioned" slab-on-grade (foundations of most new homes are post tensioned, as this is the most economical method of foundation construction), 3) slab-on-grade supported by piers, 4) structurally isolated slab with a void space under the floors, supported by piers, 5) crawl space (often incorrectly referred to as "pier and beam"). If the residence has a crawl space, verify that one square foot of net ventilation is provided for each 150 square feet of crawl space floor area. For a discussion of foundation types and their advantages and disadvantages, the interested reader may refer to *Foundation Design Options for Residential and Other Low-Rise Buildings on Expansive Soils*, paper #FPA-SC-01 (current version) published by The Foundation Performance Association and available at www.foundationperformance.org.

- ❏ Does more than one type of foundation system support the house? Mixed or hybrid foundation systems may create problems because areas supported on different foundation types may move differentially. One example is an interior floor supported by piers and perimeter shallow grade beams supported on soil. In this case, piers should support perimeter beams as well. Another example is a crawl space foundation supported by piers attached to a slab-on-grade. The slab-on-grade foundation should instead be designed as a structurally isolated slab supported by piers, or a slab on ground supported by piers depending on the Plasticity Index (PI) of the soil.

- ❏ Ask "Was the foundation designed by a Professional Engineer based on a site-specific soil report?"

- ❏ Request copies of the construction drawings and the geotechnical (soil) report. Check the soil report to determine what type of soil the house is built upon. Low PI soils tend to be more stable than high PI soils in that they do not expand and contract much with changes in moisture content. Soils that contain fine silts or expansive clays are more likely to cause foundation movement. A properly designed and constructed foundation will account for the existing and future soil conditions and likely provide excellent long-term service.

- ❏ Request a copy of the construction schedule or a letter stating when the foundation was cast, cables were stressed (if post-tensioned), drywall was floated, floor tile was installed, and the home was completed. For post-tensioned foundations, check that the cable stressing was done within 3 to 10 days of concrete placement.

- ❏ Request a copy of all certificates of completion, and inspection and observation reports.

- ❏ Request copies of aerial photos of the site prior to development. The more valuable aerial photographs will be the ones recorded in the several years prior to construction. These are readily available from sources on the internet and local companies.

- ❏ After the above documents are obtained, the buyer may elect to engage a Professional Engineer (P.E.) for an independent design and construction review.

- ❏ Determine if the house was built in an area that was originally a pond, ditch, canal, or swampy area. The filling of these areas must have been properly addressed in the design and construction. Poorly compacted fill may result in movement and deformation of a residential foundation.

- ❏ Determine if large trees were removed inside or near the foundation footprint prior to construction. Removal of large trees can cause localized soil movements that result in movement and deformation of a residential foundation.

- ❏ Spot check the floor slopes on the lowest floor using a four-foot carpenter's level and a measuring tape to determine if the foundation is substantially out of level. If more than ¼" of slope over four feet is found, it may be an indication of abnormal foundation movement and a Professional Engineer should be consulted.

- ❏ Observe for the presence of barren soils near the foundation, because they can be a source of current and future problems.

4.0 BUYER INSPECTION OF EXISTING HOMES

A common strategy for buying an existing home is to engage a P.E. or licensed real estate inspector. A licensed real estate inspector will typically inspect all main components of a house such as mechanical, electrical, and structural. These inspections can be useful in identifying most visible deficiencies of a given house. Prior to engaging a licensed real estate inspector or P.E., a potential homebuyer may do his or her own inspection.

Prior to walking through a house, it is important to be well informed about structural foundation issues. The buyer should note that there are many types of distress that occur in a house. Distress can occur from foundation movement or from other causes that are unrelated to the foundation performance. If signs of distress are found it is important to determine their cause. A helpful document about this topic is *Distress Phenomena Often Mistakenly Attributed To Foundation Movement*, paper # FPA-SC-03 (current version), published by The Foundation Performance Association and available at www.foundationperformance.org .

Some important questions to ask the seller are:

- ❏ Ask if there are any written Geotechnical Investigation reports on the house and the subdivision, made by a P.E. Also ask for any written reports on the house made by a licensed real estate inspector. Ask if there are any written reports on the house made

by a licensed real estate inspector or P.E. The Seller's Disclosure Notice (taken from Texas Association of Realtors, Inc., #TAR-1406, 4-26-04) signed by the seller states: "Within the last 4 years, have you (Seller) received any written inspection reports from persons who regularly provide inspections and who are either licensed as inspectors or otherwise permitted by law to perform inspections? Yes __ No ___ If yes, attach copies and complete the following:

- Inspection Date_____
- Type_____
- Name of Inspector_____
- No. of Pages_____"

❑ Observe the ground slopes in the vicinity of the foundation. The adjacent grade should clearly slope away from the foundation on all sides. Ground sloping toward the foundation usually allows water migration toward the foundation and may be a source of foundation problems.

❑ Have there ever been any structural foundation repairs or issues with this house? The owner is required by Texas law to provide a buyer with full and accurate disclosure of any foundation issues and or repairs.

❑ If the foundation was repaired, what was the reason, when was it done, what method, the extent, and documentation of repair?

❑ If the foundation was repaired, ask the following questions: a) is there a warranty for these repairs, b) is the warranty transferable to the new owner, c) is the repair company still in business, d) how long is the warranty period, and e) was a building permit required for the repair and, if yes, was it obtained? Typically, repair companies that offer a lifetime transferable warranty, warrant only the work they did and the components they installed, not the entire foundation. There are often warranty limitations. Most do not include repair of distress in architectural finishes, including tile and drywall cracks. Also, warranties may not cover repair of the foundation when movement is caused by uplift.

❑ Did a Professional Engineer design the foundation and are there sealed drawings and a soil report provided by a geotechnical engineering testing laboratory? If yes, *it is very important to obtain copies of these and all other construction documents that are available.* The local permitting authorities often keep copies of these drawings. Did a Professional Engineer review the foundation make-up, prior to placing the concrete?

❑ What type of foundation is supporting the house? The typical foundation types in southeast Texas are 1) slab-on-grade with steel reinforcing bars (rebar), 2) post-tensioned slab-on-grade, 3) slab-on-grade supported by piers, 4) structurally isolated slab with a void space under the floors, supported by piers, 5) crawl space (often incorrectly referred to as "pier and beam"). The interested reader may obtain more information from the *Foundation Design Options for Residential and Other Low-Rise Buildings on Expansive Soils*, paper # FPA-SC-01 (current version) published by The Foundation Performance Association, available at www.foundationperformance.org.

- ❑ If the residence has a crawl space, verify that at least one square foot of net ventilation is provided for each 150 square feet of crawl space floor area. Observe if the crawl space is moist or wet. If a sump pump is provided verify that it operates.

- ❑ Does more than one type of foundation system support the house? Mixed or hybrid foundation systems may create problems because areas supported on different foundation types may move differentially. One example is an interior floor supported by piers and perimeter shallow grade beams supported on soil. In this case, piers should support perimeter beams as well. Another example is a crawl space foundation supported by piers attached to a slab-on-grade. The slab-on-grade foundation should instead be designed as a structurally isolated slab supported by piers, or a slab on ground supported by piers depending on the PI of the soil.

- ❑ Check for the presence of barren soils near the foundation, because they can be a source of current and future problems.

While walking around and through the house, record notes of your observations.

4.1 EXTERIOR INSPECTION

- ❑ Are there any brick veneer cracks? These may be hairline (1/64" or smaller) to fairly large (1/4" or larger) gaps. Is the brick veneer or mortar cracked? Does the crack go through more than one brick? Record the length, width, and location of the cracks. Is the crack larger at the top than the bottom or vice versa? Is the crack close to a window or door or in a large expanse of brick veneer and so forth? Note if there is any distortion in expansion joints in the brick. An expansion joint that varies in thickness vertically is a possible indication of excessive foundation movement. Use coins, credit cards, thumbnail, tape measure or other available means to estimate crack widths. A series of photographs of distressed areas can be helpful when discussing the cracks with a qualified, state licensed inspecting professional .

- ❑ Look for signs of mortar repair in brick veneer or masonry walls, often called re-tucking or re-pointing. Sometimes, this is obvious because the mortar will be a different shade than the original mortar. If there is a good match in the mortar shades between old and new, spray water on the suspected area. The new mortar often shows a different shade. If mortar repairs are observed, ask why they were done. Mortar repair can be a sign of foundation movement.

- ❑ Note separations in the exterior trim. This can indicate foundation movement, poor workmanship, or wood shrinkage.

- ❑ Note separations around garage doors, especially double overhead doors. This can be a sign of foundation movement or structural framing movement due to an inadequate size or length of the header or lintel.

- ❏ Note uneven vertical separations between the window and doorframes and the surrounding veneer. Note any signs of distortion such as cracked glass panes not caused by impact.

- ❏ Note if there are any cracks in the side of grade beams (this is the concrete under the exterior walls). Hairline cracks in the grade beams are generally acceptable but may indicate that there has been some foundation movement.

- ❏ Note whether the grade beams are properly embedded with adequate exposure above the grade. The upper 6" to 12" of the grade beam should be exposed. Grade beam exposure is the concrete below the brick or wall covering.

- ❏ Note how the ground slopes. The ground beneath the landscaping topsoil or mulch should clearly slope downward away from the foundation on all sides.

- ❏ Note the existence of trees near the house with trunk diameter greater than eight inches. Ideally, the trees should be farther from the house than the canopy's mature radius. Some common problems caused by trees are 1) shrinkage of the clay soils due to drying by the root system and 2) upheaval due to root growth under the foundation. Consult with a tree specialist to determine the probable maximum radius of tree canopies and root systems.

- ❏ Note tree stumps close to the house. If these do exist, determine how long ago the trees were removed. Removal of trees near the foundation may permit moisture in the soil to increase. This may cause the expansion of clay soils resulting in upward foundation movement.

- ❏ Using a four-foot carpenter's level, note if the floors are sloping down towards the area of an existing tree(s) or up towards the area where a tree(s) has been removed. Excessive slope (more than about one-quarter inch over four feet) may be a sign of unacceptable foundation movement and a licensed professional engineer should be consulted.

- ❏ Note planters adjacent to the house. These areas should be well drained to prevent water from ponding or seeping under the foundation.

- ❏ Note the location of all drains and downspouts. Downspouts should discharge away from the foundation, into an underground drainage system, onto sloped paving, or onto splash blocks sloping away from the house. If downspouts connect to a drain, determine the location of the discharge to ensure the drain is functioning. If trees extend above the roof eave, determine if leaf strainers or leaf guards are installed on the gutter.

- ❏ Note the location of sprinkler heads relative to the foundation. Turn on the sprinkler system to ensure the heads spray away from the foundation.

- ❏ Note the use of cobblestones and other types of rock fills as decorative landscaping. When adjacent to the foundation, this type of landscaping may provide a path for water to seep under the foundation.

- ❏ Note areas, such as split-levels or sunken rooms where the finished floor elevation is below the final grade of the backfill or paving. Improper construction techniques can lead to water leaking into the below grade areas

4.2 INTERIOR INSPECTION

- ❏ Are there any cracks in the drywall? Common areas where drywall cracks occur are at the corners of windows and doors. Diagonal cracks are significant indicators of excessive foundation movement. Buckled tape, joint separation at wall corners or separations at horizontal or vertical tape joints may not indicate excessive foundation movement. Small hairline cracks are most often related to initial "settling". Drywall installation, and wood shrinkage and are not commonly a sign of foundation problems.

- ❏ Ask if the interior has been recently repainted. If yes, ask if there were any repairs made to the drywall. Look for signs of "touch-up" painting. A repair may be visible when viewing at an indirect angle towards the suspected area. Look for signs of drywall repair at repainted areas. The texture will generally be slightly different from other areas. Look for cracks or patches in closets, which are often not repaired as well as in the living areas.

- ❏ Look for signs of wallpaper that is distorted on a wall such as stretching or wrinkling in corners by shining a flashlight at an indirect angle towards the suspected area. This can be a sign of foundation movement.

4.3 SANITARY SEWER SYSTEM LEAK TEST

In some cases a problem may be due to a plumbing leak. It is prudent to have a hydrostatic leak test done if you suspect movement, or if the home was built prior to 1985. These are relatively inexpensive and can help diagnose a problem if one exists.

5.0 PROFESSIONAL STRUCTURAL INSPECTION OF A RESIDENTIAL FOUNDATION

Prior to purchasing a new or existing house, a buyer may engage a licensed Professional Engineer and/or a licensed professional real estate inspector to do a structural inspection of the house. A structural inspection of an existing home usually includes both an elevation survey and a distress survey. Together these two surveys can provide an excellent picture at a point in time of the condition of the house. The elevation difference of a foundation when originally built should typically vary not more than about one and one half inches (1.5") over its length and width. Thus any measured movement more than one and one half inches (1.5") together with distress may indicate that the foundation has undergone some differential

movement. The final conclusions are opinions based on the judgment of the inspecting professional.

5.1 ELEVATION SURVEY

An engineer doing an inspection typically uses an electronic digital level or a survey laser level to record the elevations throughout the house. These values are often plotted on a two dimensional contour map superimposed on a floor plan of the house and may include a two or three dimensional surface plot. This information will provide a "snapshot" of the levelness of the foundation at the time the elevations are taken. This can be correlated with the distress survey to identify foundation concerns and/or possible repairs. A second elevation survey taken six to twelve months later can be used to determine if the observed movement (if any) is ongoing by comparing the two sets of elevations and noting significant differences.

5.2 DISTRESS SURVEY

An engineer doing an inspection typically does a distress survey. This is usually combined with an elevation survey to correlate signs of distress with suspected movement. Signs of distress are typically noted with the approximate locations on a scaled drawing of the floor plan.

The degree and type of distress observed, correlated with the age of the house, can indicate the magnitude and/or time frame of movement that has occurred since construction or remodeling. For example, if a floor has a significant slope, but the original countertops are level, it is likely that the movement occurred before the countertops were installed, or the foundation may have been constructed out-of-level.

5.3 GEOTECHNICAL INVESTIGATION

A geotechnical investigation (soil report) identifies and classifies the engineering properties of the soil applicable to the foundation design. If the original soil report is available, the data can be correlated with the elevation and distress surveys. In some cases a new geotechnical investigation may be required based on the condition of the house and the need to accurately determine the cause of foundation movement.

In the greater Houston area, sampling of soils is usually done by boring holes twenty feet or more in depth. A geotechnical laboratory will classify the soil types, measure the soil strengths, report the plasticity index (PI), the moisture content, the ground water level, and other geotechnical information pertinent to the foundation design.

6.0 AGE OF HOUSE VERSUS DEGREE OF MOVEMENT

The age of a house is relevant to the evaluation of foundation performance. A house approximately ten years of age or older, with excessive slope but without any significant areas of distress, or areas that were repaired long ago without new distress, are likely to be

performing adequately. However, the same amount of slope for a newer house with distress could be an indication that the house is undergoing excessive differential movement. This evaluation is subjective and is usually made by a professional engineer on a case-by-case, site-specific investigation.

7.0 PROFESSIONAL INSPECTIONS

The guiding principle in purchasing a home is "buyer beware". A home is typically the most significant purchase a buyer makes in his or her lifetime. Consequently, a professional investigation prior to the purchase of a house is highly recommended.

The common types of inspection available are: hiring a licensed real estate inspector and engaging a licensed professional engineer. These professionals will evaluate the general condition of the residence. The use of each is discussed in the subsequent subsections.

7.1 ENGAGING A LICENSED REAL ESTATE INSPECTOR

The most common inspection is to hire a licensed real estate inspector, who reviews most aspects of the house, including structural systems, systems equipment (including mechanical and electrical systems, above floor plumbing, and appliances) and the foundation. The inspector is required by the Texas Real Estate Commission (TREC) to make a determination of whether the foundation is performing satisfactorily. It is recommended that the buyer discuss with the inspector whether a professional engineer should perform an additional foundation-specific investigation.

A licensed real estate inspector must pass an exam proctored by the Texas Real Estate Commission (TREC). There are no formal educational requirements to be a licensed real estate inspector in Texas. The real estate inspector should list his or her license number near the inspector's signature. To be certain the license is current, go to the TREC website at: www.trec.state.tx.us.

7.2 ENGAGING A LICENSED PROFESSIONAL ENGINEER

The buyer at his or her discretion may elect to hire a Professional Engineer, or based on the real estate inspector's results a Professional Engineer may be required to perform a more rigorous investigation of suspected structural problems and issue a written report on his or her findings.

There are many engineers who can provide this type of service, including:

- Engineers that do residential investigations to the exclusion of other areas of civil/structural engineering. These engineers often are usually the most efficient and most economical.

- Engineers that specialize in forensic investigations and expert testimony. Typically they have very specific expertise and may have advanced degrees, and their fees will usually be higher.

- Engineers that have a diversified practice and provide residential investigations and residential foundation design as a part of their practice . Typically they have very specific expertise and may have advanced degrees, and their fees also will usually be higher.

Under current Texas law, a Professional Engineer will have met certain educational and professional standards. Refer to the website of the Texas State Board of Professional Engineers (TBPE) at www.tbpe.org for more information. By Texas law, only a Professional Engineer is allowed to represent himself as a Professional Engineer and use the title, "P.E." after his or her name.

The written report by the Professional Engineer should include the imprint of his or her Seal with date and signature across the Seal. To be certain the license is current, go to the TBPE website. Finally, note that some licensed professional engineers may also possess a TREC license in addition to their professional engineering (P.E.) license.

8.0 HOW TO FIND A QUALIFIED LICENSED PROFESSIONAL ENGINEER

If the decision is made to hire a qualified Professional Engineer, it is recommended to hire an engineer or engineering firm that has both significant residential design experience and significant inspection experience. This should help to ensure an accurate assessment of a specific foundation. Some points to consider when engaging an engineer are:

- ❏ Check the validity of the engineer's license with the Texas Board of Professional Engineers as discussed in Section 7.2.

- ❏ Discuss with the engineer his or her relevant work experience.

- ❏ Ask the engineer for a list of relevant references.

9.0 SUMMARY

A homebuyer should be prepared to ask the appropriate questions and make careful observations. This document, while not a substitute for professional assistance, is meant to be a helpful guide to assist the buyer in making a more critical and unemotional evaluation of a new home or an older existing home. Some key points are:

- ❏ Get copies of all design documents including foundation drawings and geotechnical investigation report, sealed by the Professional Engineer's of record, and all

construction observation reports done during construction of the foundation before you close on the property. This documentation is more difficult to obtain after purchase.

- ❏ Ask if there are any written reports on the house made by a licensed real estate inspector or P.E.

- ❏ Ask if there have ever been any repairs to the foundation or superstructure and, if yes, ask when they were made, where they were made, why they were necessary, who made them, and what is the warranty. Ask if any claims have been made to a home warranty program, and the resolution of those claims.

- ❏ Look for signs of distress on the interior and exterior. Refer to document FPA-SC-03, *Distress Phenomena Mistakenly Attributed to Foundation Movement,* and FPA-SC-07, *Foundation Maintenance and Inspection Guide for Residential and Other Low-Rise Buildings*, both freely available at www.foundationperformance.org.

- ❏ Look for signs of repairs inside and outside.

- ❏ Look how the water is drained or lack of proper drainage. Remember that water should never flow towards or stand by a foundation.

- ❏ Observe for the presence of barren soils near the foundation, because they can be a source of current and future problems.

- ❏ Look at the irrigation system. Sprinkler heads should spray away from the foundation.

- ❏ Hire a licensed professional if serious problems are evident or suspected.

Tools to take with you on a first visit to a home you are considering buying:

- ❏ 4 ft carpenter's level
- ❏ retractable tape measure (20 ft to 30 ft is a good size)
- ❏ camera
- ❏ a means to measure crack widths, including coins, feeler gages and credit cards
- ❏ flashlight