

POLICY ADVISORY

09 98 A

Regarding Design, Evaluation and Repair of Residential Foundations

Texas Board of Professional Engineers

I. Background & Purpose

Under the exemptions of Section 20(d) of the Texas Engineering Practice Act any person who designs, constructs or repairs engineering features for a Texas residence does not need to be licensed as a professional engineer to legally perform that task. However, licensed professional engineers are actually performing a large number of the residential foundation designs, evaluations and repairs performed in Texas each year. According to data collected by the Real Estate Center at Texas A&M University, approximately 76,000 single family residential building permits were issued on an annual basis since 1995, representing a significant impact on Texas business.

The Board receives a disproportionately high number of complaints against license holders performing the design or evaluation of residential foundations. Since these complaints frequently appear to be a result of poor communications or procedures, the Board established the Residential Foundation Committee (RFC) to pinpoint some of the most common problems and offer a summary of concerns and/or recommendations for the Board's consideration. The RFC and a volunteer support team met in the fall of 1997 and spring of 1998, resulting in the issuance of two reports to the Board's General Issues Committee for staff use in drafting this policy statement. Although the RFC's reports are not a part of this policy, they provide an interesting and quite valuable commentary on various aspects of engineering related to residential foundations. Single copies of the RFC's reports are available by request or may be copied from the Board's home page at <http://www.main.org/peboard>

The purpose of this policy statement is twofold:

- A. Provide recommendations to various non engineering entities on how to minimize the probability that residential foundation problems, currently encountered by homeowners, will occur.
- B. Provide practicing licensed professional engineers with guidance in the preparation of designs and evaluations of residential foundations to minimize the probability that problems, currently encountered by homeowners, will occur.

While the Board may use this policy statement as a tool to evaluate specific complaints, this statement is not intended to replace professional engineering judgment. This statement is intended to emphasize the professional judgment requirements of Board Rules 22 TAC 131.151 155, not to replace or modify them in any way. Under no circumstances should a professional engineer use this statement as a "checklist" of activities needed to adequately perform an engineering assignment related to residential foundations. In its evaluations of complaints, the Board has consistently been most concerned that the intent of the Board rules of conduct and ethics are followed and that the public and client interests are well served. This statement is designed to underscore that concern.

II. Recommendations

While proper professional engineering practice on individual projects is integral to the success of tire project, public policy alterations should be evaluated by the local government entities for probable positive impacts on the property interests of tax paying homeowners.

The Board makes the following recommendations for consideration by the appropriate entities:

A. Where not already required by existing code, building code enforcement entities such as cities or special districts should require that a licensed professional engineer prepare the designs and directly supervise the construction to residential foundations in situations where soil conditions warrant the involvement of a professional engineer. The public entity should be concerned that warranting conditions may exist:

1. Where the weighted BRAB* equivalent plasticity index of the soil exceeds 20; or
2. Where the site settlement potential exceeds approximately one inch under expected loads; or
3. Where the structure will be supported by fill material; or
4. Where known geological hazards exist.

*Building Research Advisory Board Report #33

B. Warranting conditions should be established in one of two ways. First, licensed professional engineers call establish warranting conditions on a site specific basis. Second, in areas where general soil conditions are sufficiently well known, licensed professional engineers familiar with local conditions can be requested to aid public entities in the establishment of geographic boundaries where warranting conditions exist.

C. Purchasers of forensic foundation evaluations from licensed professional engineers should base their purchase request on one of three levels of evaluation described in section IV of this statement and understand the scope and limitations associated with that level. The requested level of evaluation to be purchased for the foundation should match the level of analysis of any other evaluations to which it may be compared if a direct comparison is desired. If a particular purpose is intended for the evaluation (such as the development of a repair plan or a forensic report), the engineer must establish the minimum level of evaluation required to adequately ` accomplish that purpose.

III. Practice Guidance for Licensed Engineers: Design and Repair

Professional engineers designing residential foundations or designing repairs for residential foundations will meet the requirements of all of the applicable Board rules of professional conduct and ethics in their practice. Special emphasis is placed upon:

A. Board Rule 22 TAC 131.151(a) Engineers have an obligation to protect the property interests of the future homeowner, the builder, the lender and all other parties involved. Inherent in this rule is the notion that an engineer is to provide an optimized, cost effective design.

B. Board Rule 22 TAC 131.151(b) Engineers must perform their design in a manner which can be favorably measured against generally accepted standards or procedures. A design or repair plan should include all information needed to delineate its scope, intended use, limitations, client contract requirements or other factors that can impact its proper implementation. If called upon to evaluate a complaint under this rule, the Board will assess engineers' work against design procedures such as the Post Tensioning Institute's design guideline, the Building Research Advisory Board Report #33, or other similar procedures. Engineers' work will be expected to address significant design issues that may include (but may not be limited to):

1. collection of sufficient geotechnical data;
2. selection of reasonable sample locations and testing activities for geotechnical data;
3. completion of a site characterization activity, denoting key feature such as the presence of water or fill material;
4. inclusion of all needed specification documentation for adequate construction of the foundation;
5. inclusion of a plan for supervising or inspecting the foundation construction; and
6. documentation of all engineering functions in a suitable manner for clients, code officials, etc.

C. Board Rule 22 TAC 131.166 Engineers must only seal work that they have personally performed or has been performed under their direct supervision. Direct supervision as defined under 22 TAC 131.18 requires the engineer to provide some acceptable combination of exertion of control over the work, regular personal presence, reasonable geographic proximity to the work being performed, and an acceptable employment relationship with the person(s) being supervised. If called upon to evaluate a complaint under this rule, the Board will evaluate all work attributed to an engineer (including post tension designs, pier layouts, repair details, etc.) for conformity to these direct supervision requirements.

D. Engineers in responsible charge of this type of work must be competent to perform it adequately. Competence is established through education, training or experience in appropriate areas of endeavor; these areas might include residential foundation design, structural engineering, soils and geotechnical engineering, materials engineering and general civil engineering.

IV. Practice Guidance for Licensed Engineers: Evaluations of Existing Foundations

A. When evaluating an existing residential foundation, engineers will be expected to report their findings in a manner that clearly identifies:

1. the purpose of the evaluation;
2. the level of evaluation at which the work was performed; and
3. limitations regarding the conclusions that are drawn given the level of evaluation used.

All evaluations, regardless of the level at which they are performed must be of professional quality as evidenced by sufficient and appropriate data, careful analyses, and disciplined and unbiased judgment

when drawing conclusions and stating opinions. In accordance with Board Rule 22 TAC 131.152(b) engineers must communicate using clear and concise language that can be readily understood by their client or other expected audiences.

B. In certain cases, the level of evaluation is established by the client. However, in most cases involving the potential for repair of a condition, the engineer will recommend an appropriate level of evaluation for the situation. Under Board Rule 22 TAC 131.155 (a), the engineer is expected to recommend and perform the lowest level of evaluation needed for adequate analysis of the situation. For the purposes of aiding the client in determining the type of evaluation performed (or desired) the Board recommends the use of the following three levels of evaluation designations:

1. Level A - This level of evaluation will be clearly identified as a report of first impression conclusions and/or recommendations and will not imply any higher level of evaluation has been performed. Level A evaluations will typically:

- a. define the scope, expectations, exclusions, and other available options;
- b. interview the home owner and/or client if possible;
- c. document visual observations personally made by the engineer during a physical walk- through;
- d. describe the analysis process used to arrive at any performance conclusion; and
- e. provide a report containing one or more of the following: observations, opinions, performance conclusions, and recommendations based on the engineer's first impressions of the condition of the foundation.

2. Level B - This level builds upon the elements found in a Level A evaluation. In addition to the items included in Level A, a Level B evaluation will typically:

- a. request and review available documents such as geotechnical reports, construction drawing, field reports, prior additions to the foundation and frame structure, etc.;
- b. determine relative foundation elevations to assess levelness at the time of evaluation and to establish a datum;
- c. if appropriate, perform noninvasive plumbing tests, recognizing that additional invasive testing is also available;
- d. document the analysis process, data and observations;
- e. provide conclusions and/or recommendations; and
- f. document the process with references to pertinent data, research, literature and the engineer's relevant experience.

3. Level C - This level builds upon the elements found in the Level B evaluation. In addition to the items included in Levels A and B, a Level C evaluation will typically:

- a. conduct noninvasive and invasive plumbing tests as required by the engineer;
- b. conduct site specific geotechnical investigations as required by the engineer;
- c. conduct materials tests as required by the engineer to reach a conclusion;

- d. obtain other data and perform analyses as required by the engineer;
- e. document the analysis processes, data and observations; and
- f. provide conclusions and/or recommendations.

C. Engineers performing evaluations of residential foundations should be especially aware of their obligations under Board Rules 22 TAC 131.153(c), 22 TAX 131.151(b) and 22 TAC 131.152 (b) as they report their findings. They should substantiate all assumptions, conclusions, and recommendations using appropriate references. Terms such as "failure" "distress" "damage", etc. must be clearly defined. When an evaluation is to be used in comparison with another report, the engineers should make every effort to provide a correlation to the definition used in the previous report in addition to any other definitions used in their own report. Engineers must draw any needed distinctions between "failures" discussed from a structural aspect and "failures" discussed from a performance aspect.

D. As previously noted in section III (D), engineers in responsible charge of this type of work must be competent to perform it adequately. Competence is established through education, training or experience in appropriate areas of endeavor; these areas might include specific residential foundation design, structural engineering, soils and geotechnical engineering, materials engineering and general civil engineering.

V. Related Advisories & Updates

There are no related advisories at this time. Updates may be made periodically by the board. Date of this advisory: 09/11/98.

Questions regarding this advisory may be sent to:

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