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Texas Risk Management Manual For 2-10 HBW® Builders, Engineers, and Fee Inspectors

Special Standards and Special Investigative Areas

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SECTION 1 - INTRODUCTION

1.1 BASIS OF THE 2005 REVISION

This revision to the Texas Risk Management Manual ("Manual") for participants in the 2-10 Home Buyers Warranty® ("2-10 HBW") Program addresses the statutory warranty and building and performance standards adopted by the Texas Residential Construction Commission ("TRCC"). The Texas Statutory Warranty became effective and applies to all residential construction that commenced on or after June 1, 2005.

The warranty insurer of the 2-10 HBW Warranty, National Home Insurance Company (A Risk Retention Group) ("NHIC") has repaired more homes with structural defects in the past ten years in Texas than all other new home warranty companies combined. Repairs made to homes constructed by builder-members in the 2-10 HBW Warranty Program have cost more than $27,000,000 during the past ten years in Texas, which is more than the repair costs in any other state. Although the Texas Statutory Warranty is similar in many ways to the 2-10 HBW Warranty, the Texas Statutory Warranty requires increased coverage beyond the coverage previously provided by 2-10 HBW Warranty. New Performance Standards for Foundations (both for slab foundations and floor over pier and beam foundations) in the Texas Limited Statutory Warranty, Subchapter D. §304.100, require that for ten years the overall deflection in the foundation from the original construction elevations "shall be no greater than the overall length over which the deflection occurs divided by 360 (L/360) and must not have more than one associated symptom of distress, as described in Section 5 of the ASCE Guidelines, that results in actual observable physical damage to the home". Foundations "shall not deflect after construction in the tilting mode in excess of one percent (1%) from the original construction elevations". Compliance with these standards for the ten year warranty term requires post-tensioned slabs be stiffened to prevent edge-lift damage caused by soil movement from exceeding this standard. These new standards of L/360 for deflection and one percent (1%) tilt may also require that many construction sites be pre-treated with moisture injection to reduce the soil movement potential. Certain sites with very high swells, cut, fill, or other geological hazards may require pier and beam foundations rather than post-tensioned slabs.

Working together, 2-10 HBW engineers and key engineers in the State of Texas have developed standardized foundation systems which will help minimize the overall deflections of your foundations. The eight (8) 2-10 HBW foundation systems described in this Manual should prevent a significant increase in structural defect repairs caused by the new statutory L/360 deflection criteria and 1% tilt. Geographic region and site specific soil conditions govern the applicability of the 2-10 HBW standard foundation systems. The suggested 2-10 HBW foundation systems are the minimum system requirements. Your engineer ultimately selects the appropriate foundation systems and your engineer may increase the design requirements.

These foundation systems will allow 2-10 HBW member builders in Texas to provide the insurance-backed structural warranty without a significant change in the warranty fee. Inaction would be costly. Projected increases in the frequency of structural defect claims and losses would translate directly into increased warranty costs. Rather than seeing an increase in the warranty fee, 2-10 HBW and NHIC believe all parties would be better served by putting these resources into improved foundations, evaluation of site conditions, and site preparation. Texas builders and home buyers both benefit from this solution; a solution in keeping with the published goals of the Texas Residential Construction Commission that "the residential construction industry provides well-built reliable homes for Texans", and that "satisfied homeowners and confident buyers are essential for Texas's housing industry to remain strong".

1.2 PURPOSE AND PHILOSOPHY OF THIS MANUAL

Quality home construction requires the cooperative efforts of builders, engineers and fee inspectors during the construction period. Everyone involved in the construction process must assume responsibility for the quality of their specific contribution and take pride in the overall quality of the finished home. It is this philosophy that guides 2-10 HBW in our goal to join everyone into one team - a team committed to building the best quality homes possible in Texas.

This Manual provides the 2-10 HBW Warranty Program guidelines to builders, engineers and fee inspectors for the geotechnical investigation, standard and nonstandard engineered foundation designs, soil treatment methods, inspection procedures, and other special requirements for home construction in Texas.

This Manual is provided to all 2-10 HBW member builders, 2-10 HBW approved engineers and 2-10 HBW approved fee inspectors in order to establish guidelines for the minimum foundation types and construction standards acceptable for homes to be enrolled in the 2-10 HBW Warranty Program. These guidelines should be considered minimum standards and supplemental to the applicable standards of the American Concrete Institute ("ACI"), the Post-Tensioning Institute's ("PTI") publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition*, the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1,*

the standards contained in the *International Residential Code for One and Two-Family Dwellings* published by the International Code Council, and any other locally adopted Model or other Building Codes used in your area. Portions of these guidelines may refer to or be based on one or more of the preceding standards, and 2-10 HBW approved engineers should obtain and be familiar with these publications. In addition to all of these guidelines, engineers and builders must always be alert to conditions that require additional design and construction quality in order to fulfill our team goal of building the best quality homes possible in Texas. Exceptions to the 2-10 HBW guidelines may be considered on a case by case basis, and are subject to independent peer review. Any variations from the 2-10 HBW guidelines, however, must be pre-approved by 2-10 HBW Risk Management and NHIC prior to the start of construction.

1.3 RESPONSIBILITIES OF THE BUILDER FOR QUALITY CONTROL

The builder must be the leader of the team that is committed to building the best quality homes possible in Texas. Builders must exercise control of the construction process on each home either on a personal basis or through their superintendents. Superintendents must have the responsibility and authority to accept or reject the work of all construction subcontractors and builder employees in order to assure that each home is constructed in strict agreement with the plans and specifications which have been signed and sealed by the builder's engineer.

As the team leader in our commitment to quality construction, the builder must lead the construction process from ground breaking to final walk-through by putting quality workmanship as the top prerequisite in the selection of subcontractors and employee craftsmen. Ultimately, the builder is solely responsible for the quality of the construction.

1.4 RESPONSIBILITIES OF ENGINEER FOR QUALITY ASSURANCE

Engineers have a unique position on the teams that are committed to building quality homes in Texas. First, the geotechnical engineer investigates the soils and geological conditions at the proposed construction site and recommends the 2-10 HBW standard or nonstandard foundation type or soil improvement method. Then, the structural engineer designs the foundation based on the geotechnical engineer's findings, the applicable standards of the American Concrete Institute (ACI), the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition*, the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1* and 2-10 HBW's guidelines. Finally, engineering personnel or fee inspectors perform all inspections on the engineered foundation during the construction process.

Engineers are in a unique position on the team because they identify site specific soil, vegetation and terrain, or geological conditions, specify which standardized or nonstandard foundation system is applicable in the plans and specifications, recommend moisture

treatment as needed, and inspect the construction to be sure the constructed systems meet or exceed their designs. An inspection is defined, for the purpose of these guidelines, as critical appraisal by closely viewing, by physical measurements and/or observations of construction in progress or completed construction to make a professional judgment concerning compliance with the construction plans and specifications, 2-10 HBW guidelines, and the local Building Code(s). Clearly engineers are responsible for the quality of many of the important features of homes built in Texas.

1.5 RESPONSIBILITIES OF FEE INSPECTOR FOR QUALITY ASSURANCE

In Texas, 2-10 HBW and NHIC rely on approved independent fee inspectors for assurance that all construction inspected by them, is in compliance with 2-10 HBW's minimum construction standards and the local Building Code(s). These independent fee inspectors have demonstrated a professional degree of knowledge in local construction practices and verify that these practices are in compliance with 2-10 HBW standards as well as the local Building Code(s). 2-10 HBW approved independent fee inspectors are in a unique position and oversee important aspects of the quality control program.

1.6 RESPONSIBILITIES OF 2-10 HBW FOR QUALITY INSPECTION

In the 2-10 HBW Warranty Program, quality control inspectors conduct random, unannounced, quality control inspections to spot check the quality of various aspects of the builder construction, and also the quality of inspections by engineers, fee inspectors and building department inspectors. We all must accept responsibility for assuring quality construction. Therefore, whenever quality violations are observed, these violations will be cited and the builder may be placed in a P-1 probation status in the 2-10 HBW Warranty Program. Homes that are not constructed in accordance with the standards contained in this Manual may not be eligible for enrollment in the 2-10 HBW Warranty Program, and if quality violations continue, the builder may be subject to termination from the 2-10 HBW Warranty Program. Engineers or fee inspectors who perform poor quality inspections will be cited for quality violations and may be removed from the 2-10 HBW List of Approved Engineers or List of Approved Fee Inspectors should violations continue. 2-10 HBW and NHIC reserve the right to maintain the approved Engineer, Fee Inspector, and Peer Review Engineer lists, and may add to or remove from these lists at 2-10 HBW's and NHIC's sole discretion.

1.7 QUALITY CONSTRUCTION FOR TEXAS HOME BUYERS

2-10 HBW and NHIC looks forward to the continued success of the 2-10 HBW Warranty Program, wherein teams of builders, engineers, and fee inspectors have joined together to build homes in Texas that meet or exceed the Performance Standards for Foundations and Major Structural Components set forth by the Texas Residential Construction Commission ("TRCC") in the *Limited Statutory Warranty and Building and Performance*

Standards. When an enrolled home fails during the ten-year warranty term to meet the Performance Standards for Foundations and Major Structural Components defined in the 2-10 HBW Limited Warranty, builders and buyers can rest assured that the home will be repaired under the terms of the warranty. "Quality Construction for Texans" was the impetus behind and the motto of the TRCC, a commitment to quality shared by 2-10 HBW, NHIC and Builder Members in the 2-10 HBW Warranty Program. When your name and the 2-10 HBW Warranty go on a completed home, we can take pride in the quality of workmanship and built-in structural integrity. This pride comes only when everyone shares in the responsibility for quality construction.

SECTION 2

TEXAS HOME ENROLLMENT PROCEDURES

2.1 NOTIFICATION OF CONSTRUCTION

Complete the Notification of Construction and Inspection Form (Form 108) ("NOC") for each lot or for a complete subdivision and forward to 2-10 HBW at the address listed below fifteen (15) days before any construction starts on any lot. Complete a separate NOC for each 2-10 HBW standard or nonstandard foundation type used within a subdivision.

2.2 NOTIFICATION OF STARTS

Complete the Notification of Starts Form (Form NOS) ("NOS") for homes to be enrolled in the 2-10 HBW Warranty Program. Return the form along with the appropriate deposit per unit no later than fifteen (15) days prior to breaking ground to 2-10 HBW at the address listed below.

2.3 SPECIAL STANDARDS AND SPECIAL INVESTIGATIVE AREAS

All of Texas is a Special Standards Area. Special Standards Areas are defined in the Home Buyers Warranty Program Limited Workmanship/Systems and Structural Coverage Builder Proposal and Agreement as geographical areas which 2-10 HBW and NHIC believe present a greater than usual risk of structural failure. In addition, based on soil conditions and NHIC claims experience, all of Dallas, and portions of Fort Worth, San Antonio and Austin are in the Central Texas Special Investigative Area. Special Standards requirements for the Special Investigative Area differ from other areas of Texas, and are described in Sections 3 and 4 of this Manual. A map of the Special Investigative Area is found in Section 3.12 of this Manual.

2.4 GEOTECHNICAL REPORT

In the Central Texas Special Investigative Area, which includes all of Dallas, and portions of Fort Worth, San Antonio and Austin, submit a copy of the lot Geotechnical Report, one for each lot or a copy of the subdivision Geotechnical Report, one for each subdivision, fifteen (15) days prior to ground breaking. See Section 3.6 for Geotechnical Report requirements and Section 3.12 for map of the Central Texas Special Investigative Area. Geotechnical Report or a Standard Design Letter from the builder's engineer shall recommend the appropriate 2-10 HBW standard foundation(s), nonstandard foundation, or soil treatment method to be utilized by the builder. All other areas of Texas identified by geotechnical engineers as having expansive, compressible or other deleterious soil conditions (necessitating the use of 2-10 HBW Slabs I, I-C, II, II-C, III or III-C, nonstandard foundation type, or soil treatment method), also submit a copy of the Geotechnical Report, one report for each lot or a copy of the subdivision Geotechnical Report, one report for each subdivision fifteen (15) days prior to ground breaking. See Section 4.4 for Slabs II, II-C, III and III-C and Section 4.6 for nonstandard foundation requirements. For lots or subdivisions outside the Central Texas Special Investigative Area, and if the soils are non-expansive soils, Geotechnical Reports do not have to be submitted.

2.5 STANDARD DESIGN LETTER

For lots or subdivisions inside the Central Texas Special Investigative Area, and when the Geotechnical Report does not provide 2-10 HBW standardized foundation recommendations, submit the 2-10 HBW Standard Design Letter. The 2-10 HBW Standard Design Letter shall indicate which 2-10 HBW standard foundation type the builder's structural engineer recommended for use in the construction of the home based on the lot specific geotechnical investigation. The Standard Design Letter shall be signed and sealed by a 2-10 HBW approved structural engineer. Letters should be submitted with the required inspections.

2.6 MAXIMUM DESIGN LETTER

For lots inside the Central Texas Special Investigative Area where boring number or spacing does not meet the requirements described in Section 3.4.1; or where field investigation was not performed and geotechnical investigation and report are not required by county or local governing agencies; submit the 2-10 HBW Maximum Design Letter. Maximum Design Letter for Central Texas Special Investigative Area should state that based on knowledge of local conditions and engineering judgment, 2-10 HBW Slab III or III-C is adequate for the worse soil conditions anticipated. Maximum Design Letter shall indicate whether Slab III or III-C was recommended. All other areas of Texas identified by engineers as having expansive soil conditions but where boring number or spacing does not meet the requirements described in Section 3.4.1; or where field investigation was not performed and geotechnical investigation and report are not required by county or local

governing agencies; may also submit the 2-10 HBW Maximum Design Letter. Maximum Design Letter for all other areas of Texas should state that based on knowledge of local conditions and engineering judgment 2-10 HBW Slab II, II-C, III, or III-C (indicate which) is adequate for the worse soil conditions anticipated. The Maximum Design Letter shall be signed and sealed by a 2-10 HBW approved structural engineer. Letters should be submitted with the required inspections.

2-10 HBW and NHIC recommend field investigation, laboratory testing program, and geotechnical report; and where Maximum Design Letter is used in lieu of Geotechnical Report, reserve the right, in their sole discretion, to determine the acceptability of any Maximum Design Letter.

2.7 MANDATORY INSPECTIONS

Refer to Section 5 to determine the mandatory inspections required for the 2-10 HBW standardized or nonstandard foundation type recommended. These inspections on engineered foundation systems must be performed by a 2-10 HBW approved engineer or fee inspector.

2.8 CERTIFICATE OF WARRANTY COVERAGE

Upon completion of the actions described in the preceding sections and completion of all requirements contained in this Manual, the builder shall forward to Home Buyers Warranty Corporation the completed Builder Application for Home Enrollment (Form 302), including the buyers name, closing date, type of housing, type of financing, sales price, builder signature, and buyers signature under the Buyers Acknowledgement and Consent, along with full warranty fee. Upon satisfactory completion of all enrollment requirements, the Certificate of Warranty Coverage will be issued to the homeowner. Builders or their closing agent should send all enrollment requirements described in this Manual, including Notice of Construction, Geotechnical Report, 2-10 HBW Standard Design Letter, inspections, and the Builder Application for Home Enrollment to:

HOME BUYERS WARRANTY CORPORATION
1417 West Arkansas Lane
Arlington, Texas 76013-6271
(817) 265-1100
(800) 488-8844

SECTION 3

TEXAS GEOTECHNICAL ENGINEERING

3.1 INTRODUCTION

This Section 3 contains the guidelines for all new residential construction to be enrolled in the 2-10 HBW Warranty Program for subsurface field investigations, laboratory testing, and geotechnical reports on individual lots or subdivisions in the state of Texas. 2-10 HBW and NHIC reserve the right, in their sole discretion, to examine, audit, and determine the acceptability of all field investigations, laboratory testing programs, and geotechnical reports. Compliance with the provisions contained herein is the responsibility of the geotechnical engineer. Neither 2-10 HBW nor NHIC make any warranty that the geotechnical engineer adhered to the recommendations contained herein. 2-10 HBW and NHIC may at their sole discretion approve or reject any home proposed to be enrolled in the 2-10 HBW Warranty Program.

3.1.1 Expansive Soils

Soils shall be classified consistent with Section 1802.3.1 or 1802.3.2 of the *International Building Code*, and Section 3.2.1. of the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition.* Expansive soils are defined as soils meeting the following conditions:

1. Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D 4318.
2. More than ten percent (10%) of the soil particles pass a No. 200 sieve, determined in accordance with ASTM D 422.
3. More than ten percent (10%) of the soil particles are less than five (5) micrometers in size, determined in accordance with ASTM D 422.
4. Expansion Index greater than twenty (20), determined in accordance with ASTM D 4829.

3.2 GEOTECHNICAL ENGINEER APPROVAL

All Geotechnical Reports submitted by 2-10 HBW member builders must be authored, signed and sealed by a geotechnical engineer that is listed on the 2-10 HBW Approved Geotechnical Engineer List for the state of Texas. See Section 6 for details on the engineering approval procedures.

3.3 SPECIAL INVESTIGATIVE AREAS

All foundations for homes constructed in Texas shall at a minimum: (a) satisfy one of eight (8) standard 2-10 HBW foundation systems, or (b) on lots where expansive or consolidating soil conditions preclude the use of a 2-10 HBW standard slab, be either (i) a nonstandard foundation design by a 2-10 HBW approved structural engineer, or (ii) an acceptable soil treatment method by a 2-10 HBW approved geotechnical or structural engineer. The design recommended by the builder's engineer shall be based on a geotechnical investigation performed by a 2-10 HBW approved geotechnical engineer.

The areas designated on the 2-10 HBW Map of Texas as the Central Texas Special Investigative Area will require additional testing and design procedures. This region includes the shaded area on the Central Texas Special Investigative Areas Map and any additional regions identified by geotechnical engineers as having expansive, consolidating or other deleterious soil conditions.

3.4 FIELD INVESTIGATIONS

All portions of the subsurface investigation, testing, and geotechnical report shall be conducted in accordance with current American Society for Testing and Materials (ASTM) Standards, the guidelines for geotechnical investigations described in Chapter 3 of Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* Section 4 of the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1,* and the current standard practices of geotechnical engineers in the state of Texas.

The geotechnical engineer shall design the proposed exploration program. The scope of the field investigation may vary from site to site; however, the following are minimum guidelines:

3.4.1 Site Borings

Individual Lots: For lots in the Central Texas Special Investigative Area and where maximum unrestrained differential soil movement (y_m) is equal to or greater than 1 inch, two (2) borings are required, one (1) at each diagonal corner of the proposed structure. Minimum depth of these borings is twenty feet (20') below final foundation level or to refusal as verified by the geotechnical engineer. For lots having y_m of less than 1 inch, one (1) boring is acceptable; minimum depth of this boring is fifteen feet (15') below final foundation level or to refusal as verified by the geotechnical engineer. For prior field investigations where limestone or other non-expansive bedrock formations were encountered at or near the ground surface, 2-10 HBW Risk Management or NHIC may, in their sole discretion, waive or otherwise modify this requirement.

For lots outside the Central Texas Special Investigative Area, and if the soils are stable and non-expansive, Geotechnical Reports do not have to be submitted. When a geotechnical investigation is required to determine the presence of expansive soils, and such investigation finds maximum unrestrained differential soil movement (y_m) is less than 1 inch or plasticity index (PI) is less than 15, one (1) boring is acceptable. Minimum depth of this boring is fifteen feet (15') below final foundation level or to refusal as verified by the geotechnical engineer.

Subdivisions: Inside the Central Texas Special Investigative Area and where maximum unrestrained differential soil movement (y_m) reported from any sample is equal to or greater than 1 inch, borings will be spaced a maximum of two hundred feet (200') on center in each direction throughout the entire platted subdivision. Minimum depth of these borings is twenty feet (20') below foundation level or to refusal as verified by the geotechnical engineer. For subdivisions where y_m reported from all samples is less than 1 inch, borings may be spaced at four hundred feet (400') on centers in both directions. Minimum depth of these borings is fifteen feet (15') below foundation level or to refusal as verified by the geotechnical engineer. Boring depths in areas containing unstable or other active soils will be determined by the geotechnical engineer but must meet the above minimum recommended depth guidelines. For field investigations where limestone or other non-expansive bedrock formations were encountered at or near the ground surface throughout the subdivision, 2-10 HBW Risk Management or NHIC may, in their sole discretion, waive or otherwise modify this requirement.

For subdivisions outside the Central Texas Special Investigative Area and if the soils are stable and non-expansive, Geotechnical Reports do not have to be submitted. Where geotechnical investigation is required to determine presence of expansive soils, and such investigation finds maximum unrestrained differential soil movement (y_m) is less than 1 inch or plasticity index (PI) less than 15, borings may be spaced at four hundred feet (400') on centers in both directions. Minimum depth of these borings is fifteen feet (15') below foundation level or to refusal as verified by the geotechnical engineer.

Sampling: All borings shall be sampled at a minimum interval of one sample every two feet (2') in the upper ten feet (10') of the boring, and at five foot (5') intervals thereafter. Field logs should note any inclusions, such as roots, organics, fill, calcareous nodules, gravel, or man made materials.

3.4.2 Special Geological Assessment

If the geotechnical engineer concludes that strata of expansive clays, claystone or shale, or other formations considered potentially detrimental to the type of construction proposed are present in faulted, fissured or inclined conditions, and

therefore cannot be accurately located or identified using conventional vertical drilling and coring methods, the engineer will recommend a method of investigation that will readily identify faulted, fissured, or inclined strata as it occurs in the specific lot or subdivision considered for construction. Such recommendations may include, but not be limited to, observation trenching or inclined boring.

3.4.3 Penetration Tests

Standard penetration tests shall be conducted as directed by the geotechnical engineer.

3.4.4 Groundwater Levels

Groundwater levels shall be recorded during the drilling operation and, at the direction of the geotechnical engineer, during follow up site visits within a twenty-four (24) hour period.

3.4.5 Compaction Tests

If the foundation is supported by fill material, the geotechnical engineer must perform field density tests, and strength tests, to confirm adequate bearing capacity. Compaction tests must be performed on each eight inch (8") lift of fill and compaction reports submitted to 2-10 HBW. Cut/fill lots will require specific design requirements to ensure that adequate foundation support is present.

3.4.6 Foundations Supported on Cut/Fill Lots

Recommendations for foundations which will be supported on both native soil (cut) and compacted structural fill must be addressed by the geotechnical engineer. Recommendations may include pier and grade beam or other nonstandard foundation, and will be included in the Geotechnical Report submitted to 2-10 HBW. Borings for subsurface investigations for subdivisions that will utilize cut/fill lots must be done after all cut/fill operations are completed. Any fill within a subdivision must be located, tested for proper compaction and strength, and reported in the engineer's report.

3.5 LABORATORY TESTING

All laboratory testing shall be conducted in general accordance with current American Society for Testing and Materials (ASTM) or other recognized standards, the guidelines for laboratory testing programs described in Chapter 3 of Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* the guidelines for minimum laboratory testing programs described in Section 4 of the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of*

Residential Foundations, Version 1, and the current standard practices of geotechnical engineers in the state of Texas. The geotechnical engineer shall develop the laboratory testing program. Sufficient laboratory testing shall be performed to identify significant strata and soil properties found in the site borings. Such tests may include:

1. Dry Density
2. Moisture Content
3. Atterberg Limits
4. Estimates of Cohesive Strength using Pocket Penetrometer or Torvane®
5. Confined or Unconfined Compressive Strength tests
6. Swell and/or Shrinkage Tests
7. Hydrometer Testing to obtain percentage smaller than 2 microns sizes
8. Sieve Size Percentage through #200
9. Soil Suction Tests
10. Consolidation – Swell Pressure Testing
11. Expansion Index Test

3.6 GEOTECHNICAL REPORTS

Geotechnical Reports shall meet the guidelines for geotechnical reports described in Chapter 3 of Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* Section 4 *of* the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1,* and the current standard practices of geotechnical engineers in the state of Texas. The Geotechnical Report shall be prepared, signed and wet sealed by a 2-10 HBW approved geotechnical engineer and shall include the following information:

1. Name and address of firm preparing the report
2. Report date and project number
3. References to other known geotechnical reports for the property
4. Site location and legal description
5. Proposed construction description
6. Date of field investigations
7. Investigative procedures
8. Plan of boring locations drawn to scale
9. Log for each boring, notes to groundwater, and penetration test locations
10. Laboratory testing procedures
11. Laboratory testing results (to include swell test)
12. Standard or nonstandard foundation recommendations
13. Site characterization
14. Topography, including drainage features and slopes
15. Trees and other vegetation
16. Landscaping and irrigation

17. Geotechnical conditions, including estimated swell-shrink or consolidation type foundation movement
18. Risk Assessment of geological hazards
19. Active or inactive surface faults, if applicable
20. Recommendation for site preparation and structural fill placement
21. Location and depth of fill (density tests if required)
22. Construction inspection requirements
23. Design consultation requirements

3.6.1 Central Texas and All Expansive Soils Conditions

All Geotechnical Investigations and Reports prepared for home construction in the Central Texas Special Investigative Area, and all other areas of Texas where expansive soils are encountered, shall also include the following Post-Tensioning Institute (PTI) design parameters:

1. e_m and y_m for edge lift and center lift modes;
2. e_m and y_m design recommendations shall take into account the added effect of trees, brushes, irrigated landscape, and other environmental factors including subsurface anomalies such as perched water. Recommendations shall be based on design suction profile change and laboratory determined values of suction-compression index;
3. e_m and y_m shall be reported for suction profiles varying from equilibrium, and for probable extreme suction conditions;
4. Any recommended soil treatment method(s) to reduce the soil movement potential;
5. Methods for dealing with trees and other environmental concerns that may affect foundation performance; and
6. Moisture control procedures to help reduce soil movement.

3.6.2 Nonconforming Geotechnical Investigations and Reports

All Geotechnical Reports completed by 2-10 HBW-approved geotechnical engineers after June 1, 2006 shall meet the guidelines contained in this Section and Chapter 3 of Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition*. The 3rd edition of the PTI publication contains a major revision in the determination of geotechnical design parameters. Geotechnical Reports completed prior to this date and/or prior to engineer's 2-10 HBW approval may not contain e_m and y_m values for edge lift and center lift modes; or may contain values for e_m and y_m that were not determined in accordance with PTI 3rd edition methodology. Values for y_m determined by methods other than those contained in the 3rd edition of the PTI publication can not be used in selecting the appropriate 2-10 HBW standardized foundation system. Structural engineers designing foundations using Geotechnical Reports

not meeting the guidelines contained in this Section and the 3rd edition of the PTI publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition* may use the following chart to assist in selecting the minimum 2-10 HBW standardized foundation system, nonstandard foundation design, or soil treatment method; for a corresponding Site Plasticity Index. See Section 3.6.3, below, for determination of Site Plasticity Index. Many factors will influence the decision whether to use the minimum slab type or a stiffer design, including knowledge of local soil conditions and slab plan geometry. Shape Factor (*SF*), which is the ratio of the square of foundation perimeter to foundation area, should also be considered. Slab geometries with a Shape Factor greater than 24 will require modifications to the building footprint, additional reinforcing, additional beams, deeper beams, or soil treatment methods to reduce swell potential.

Site Plasticity Index	Minimum HBW Slab Type
0-22	I or I-C
23-45	II or II-C
46-65	III or III-C

Engineers should select the appropriate 2-10 HBW standardized foundation type based on their experience and engineering judgment. Differential soil movement and slab interaction is a complex phenomenon involving the knowledge of accurate soil properties, soil suction variability and reasonable estimates (distributions) of these values in the specific locale under evaluation. In some cases, reliance on PI in lieu of suction testing may not accurately predict differential soil movement potential, and may lead the engineer to use of a lower maximum PI value in determining slab type. As a consequence, 2-10 HBW recommends early adoption of the guidelines for Geotechnical Reports contained in this Section and Chapter 3 of Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition.* The engineer and designer should also use reasonable engineering judgment in developing PTI parameters for their locale based upon the PTI guidelines. The Post-Tensioning Institute's guidelines for the design of slabs-on-ground are based upon evaluating the constant suction at depth and estimating the appropriate suction change envelopes at the surface and within the moisture active zone to predict differential soil movements, which influence shear forces, deflections, and moments affecting foundation systems and their designs.

3.6.3 Site Plasticity Index Determination

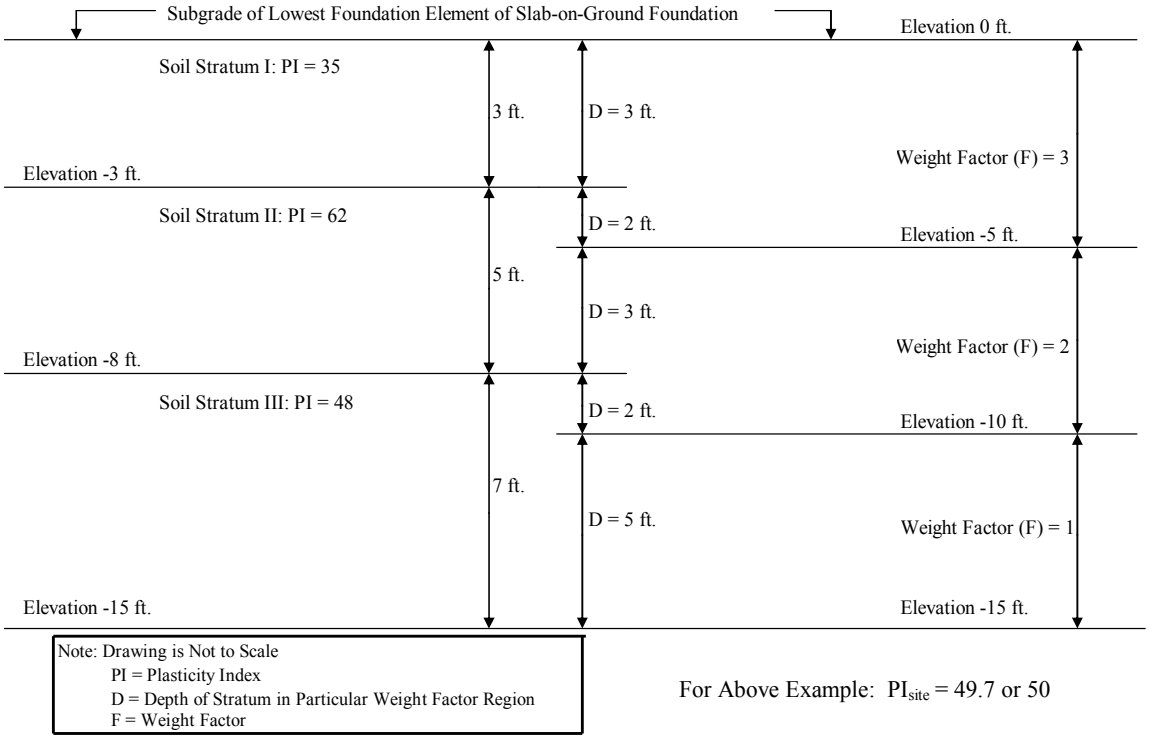
The Site Plasticity Index or Effective Plasticity Index (PI_{site}) shall be used to determine the 2-10 HBW slab type. The Site Plasticity Index shall be determined as a weighted average of the PI of the different soil strata within the upper 15 feet of the subgrade lowest foundation element of the Slab-on-Ground (Post-Tensioned or Conventionally Reinforced) Foundation. The Site PI or Effective PI (PI_{site}) shall be determined in accordance with Section 7.8.1, Part A of Building Research Advisory Board (1968), "National Research Council Criteria for Selection and Design of Residential Slabs-on-Ground", Report No. 33.

PI_{site} is taken as the weighted average of the PI for soil strata within the top 15 feet of soil below the lowest foundation element of the Slab-on-Ground Foundation. Weight Factors of 3, 2 and 1 shall be used for the top 5 feet, the middle 5 feet, and the bottom 5 feet, respectively. PI_{site} shall be determined by a Registered Professional Engineer and shall use the following equation:

$$PI_{site} = \Sigma (F_i \times D_i \times PI_i) / \Sigma (F_i \times D_i)$$

Where: F_i = Weight Factor
D_i = Depth of Soil Stratum within Particular Weight Factor Region
PI_i = Plasticity Index of Soil Stratum within Particular Weight Factor Region

Note that $\Sigma (F_i \times D_i)$ should always equal 30 feet regardless of the number of soil strata.



Soil Profile with Variable Plasticity Index for Different Soil Strata

3.7 SITE CHARACTERIZATION & CONSTRUCTION REQUIREMENTS

3.7.1 Geology & Topography

The Geotechnical Report must contain the engineer's recommendations for special engineering and construction requirements as affected by known water tables, land formations, topography, water soluble sulfates, slopes, subsidence conditions and any other features likely to affect the structures to be built on the site. The geotechnical engineer will indicate if his/her field or laboratory investigations have revealed any conditions that would require special site preparation or foundation design.

3.7.2 All Fills Supporting Foundation Loads

The geotechnical engineer must be provided with a site grading plan prior to performing the geotechnical engineering study. The site grading plan will make the geotechnical engineer aware of all cut and fill operations proposed for the site and conduct his/her geotechnical investigations accordingly. Cut and fill operations, including all structural fills placed on site shall be supervised by the geotechnical engineer or his/her qualified technician in accordance the Home Buyers Warranty Program Limited Workmanship/Systems and Structural Coverage Builder Proposal and Agreement.

2-10 HBW and NHIC reserve the right to require documentation of compaction test results on all structural fills. The geotechnical engineer must comment on the suitability of naturally occurring soils to support the type of foundation system recommended. If the geotechnical engineer determines the in-situ soil conditions are not suitable for slab-on-ground foundation support, the geotechnical engineer shall provide alternate suitable foundation recommendations and/or recommendations for improvement or replacement of unsuitable native soils. If structural fill is necessary, the engineer shall state the material and compaction requirements for the necessary structural fill.

3.7.3 Foundation Recommendation

The Geotechnical Report must provide sufficient detail to allow the structural engineer to select a 2-10 HBW standard or nonstandard foundation type, or accepted soil treatment method. A Standard Design Letter from the structural engineer will be required if the Geotechnical Report does not contain specific 2-10 HBW standardized foundation system recommendations.

3.7.4 Drainage

The geotechnical engineer shall determine if a foundation drain is necessary and if so, provide the design details for such drain.

The geotechnical engineer should provide grading recommendations to allow for suitable drainage away from the structure. The geotechnical engineer will state if any naturally occurring drainage patterns will be altered and must provide a suitable remedy for any adverse alterations.

The geotechnical engineer will provide the design details for any subdivision or lot interceptor drains or any other large scale drainage control systems deemed necessary by the engineer.

3.8 GEOTECHNICAL PEER REVIEW

To provide more accurate determination of soil properties, including acceptable likelihood of an accurate e_m and y_m along with correct application of unsaturated soil mechanics theory and methods, 2-10 HBW Risk Management or NHIC may require, at their sole discretion, periodic geotechnical peer review by firms with well-established reputations in unsaturated soil mechanics. The cost of this peer review will be borne by the member builder or member builder's geotechnical engineer. Builders should contact 2-10 HBW Risk Management for more information on geotechnical peer review.

3.9 HISTORICAL SITE REVIEW

To provide more accurate site characterization and the need for additional geotechnical investigation, on subdivision developments consisting of fifty (50) or more homes, 2-10 HBW Risk Management recommends a historical site review or Geoneering™. Geoneering™ is a patent-pending process that uses spatial analysis with aerial images and soil survey maps to evaluate historical changes in topography and vegetation. It involves not only geotechnical aspects of the site, but also integrates surficial features including topographic, GIS and aerial photographic interpretation. The articulation, integration, analysis and interpretation of this information can greatly reduce the risk of unanticipated soil movement through identification of subsurface anomalies. At this time Bryant Consultants Inc. is the only geotechnical firm accredited to perform this service.

3.10 SOIL IMPROVEMENT METHODS

Expansive soils may be removed or pre-treated to reduce soil movement potential. Over-excavation and moisture conditioning, wherein surface and near surface soils are replaced with structural fill under the supervision of the geotechnical engineer, may reduce soil heave

and improve foundation performance. Water injection, wherein water is injected into expansive clay soils to pre-swell the clay prior to construction, is an acceptable soil treatment method. A significant reduction in y_m may be possible if the water injection process is properly performed and confirmed with an additional geotechnical boring. All other soil treatment methods, including chemical injection, are subject to independent geotechnical peer review and must be pre-approved by 2-10 HBW Risk Management or NHIC. Sites where geotechnical investigation indicates that y_m is greater than 3.0 inches and the builder's engineer selects a foundation design that requires soil treatment methods to reduce the soil movement potential to y_m of 2.0 inches or less are also subject to independent peer review.

3.11 SPECIAL DRAINAGE GUIDELINES

Foundation: If water is within two feet (2') of the foundation elevation, the geotechnical engineer must design an adequate dewatering system to keep the water a minimum of two feet (2') below the foundation.

Surface: Positive outfall away from the structure must be obtained. The minimum slope away from the foundation shall be five percent (5%) for the first ten feet (6 inches in 10 feet) if expansive soils are present. Where a five percent (5%) slope is not possible, such as around patios, at rear high point on ("A") lots graded to drain from back to front, or at side high points on ("B") lots graded to drain to the front and back, slope may be reduced in these localized areas as necessitated by site or design constraints. Runoff water from roofs and slope drainage should be collected and directed away from the home by swales. The minimum slope to the high end of the swale should be one percent (1%).

Gutters and Downspouts: On all homes in the Central Texas Special Investigative Area located on sites underlain by expansive soils as defined in Section 3.1.1, rain gutters and downspouts must be installed to allow runoff to drain beyond the limits of the foundation. Downspouts must discharge water beyond the backfill area, or a minimum of three feet (3') from the foundation. Where downspouts or extensions terminate onto sidewalks, chase drains are recommended. Buried piping that attaches to the end of the downspout is acceptable provided the piping has no perforations, has continuous positive slope, and is day lighted to positive surface drainage. Splash blocks are required below hose bibs that discharge onto backfill areas.

3.11.1 Landscaping

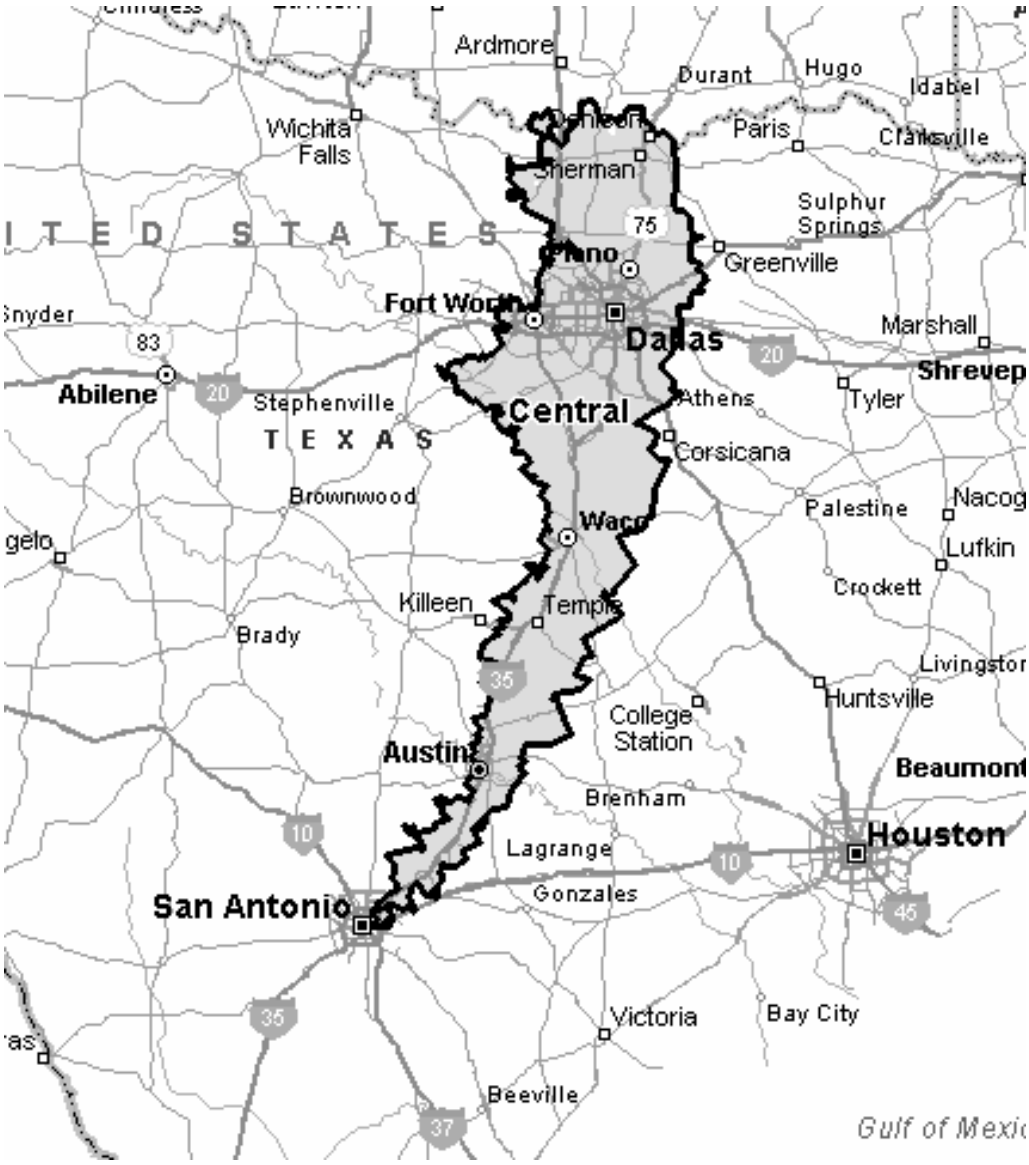
The geotechnical engineer shall state specific requirements concerning the installation of sod, irrigation, downspouts and any landscaping that may affect the structure. Minimum distances of landscaping from the foundation perimeter shall be

stated. No trees or other vegetation over six feet (6') in height shall be planted within twenty feet (20') of home unless specifically accounted for in the design of the foundation.

Where expansive soils are present, 2-10 HBW Risk Management and NHIC recommend that member builder furnishes information to homebuyers regarding landscaping, care, and long-term maintenance of homes on active soils.

3.12 TEXAS MAP

This map shows the Central Texas Special Investigative Area, which includes all of Dallas, and portions of Fort Worth, San Antonio and Austin. Builders and engineers constructing or designing foundations in Fort Worth, San Antonio and Austin should contact 2-10 HBW Risk Management or NHIC to determine if home(s) proposed for enrollment in the 2-10 HBW Warranty Program are within the Central Texas Special Investigative Area.



SECTION 4

TEXAS FOUNDATION ENGINEERING

4.1 INTRODUCTION

Minimum foundation guidelines for all Texas homes proposed for enrollment in the 2-10 HBW Warranty Program are contained within Section 4. All engineered foundations must be designed by licensed and 2-10 HBW approved engineers in accordance with the guidelines in this Manual. The 2-10 HBW engineers have developed standardized foundation systems using engineering analyses of the most probable subsurface conditions expected for new home construction in Texas. There are four (4) post-tensioned foundation types, identified as 2-10 HBW Slabs I, II, III, and IV. The four (4) foundation types each have a conventionally reinforced alternative, identified as 2-10 HBW Slabs I-C, II-C, III-C, and IV-C; for a total of eight (8) 2-10 HBW slab types. The standardized foundation systems are the minimum acceptable design for the majority of soil conditions encountered and the construction methods commonly used in Texas. The builder's engineer shall select the appropriate foundation system for the geographic region and site-specific soil conditions. For sites having clays with very high expansive characteristics, cut, fill, slopes, or other adverse conditions described in this section, the standardized designs may not be sufficient. In such instances, the Structural Engineer will design an alternative foundation system or specify an approved soil treatment method in accordance with the Geotechnical Report recommendations, the 2-10 HBW guidelines in this Manual, and the local Building Codes.

While the use of a 2-10 HBW standardized foundation system may reduce the risk of foundation failure under the site specific conditions for which it was intended, it does not eliminate all risk. Subsurface anomalies, invalid subsurface information, omissions, or construction error may result in standard designs not performing adequately. 2-10 HBW and NHIC assume no liability for slab performance other than the liability defined in the 2-10 HBW Warranty Program for the enrolled home at the address identified on the Certificate of Warranty Coverage. (Enrollment procedures and Certificate of Warranty Coverage are described in Section 2.) 2-10 HBW and NHIC have provided the 2-10 HBW standard slab foundations as minimum Warranty Program guidelines. The final selection of the foundation system may exceed the minimum guidelines as determined by the builder's engineer. **Builders not participating in the 2-10 HBW Warranty program, or homes not enrolled in the 2-10 HBW Warranty Program should not utilize this Manual and these foundation systems.** 2-10 HBW and NHIC reserve the right, in their sole discretion, to examine, audit, and determine the acceptability of all engineering investigations, foundation designs developed, and soil treatment methods. Compliance with the provisions contained herein is the responsibility of the structural or geotechnical engineer. Neither 2-10 HBW nor NHIC make any warranty, expressed or implied, that the engineer adhered to the recommendations contained herein. 2-10 HBW and NHIC may in their sole discretion approve or reject any home proposed to be enrolled in the 2-10 HBW Warranty Program.

4.2 FOUNDATION ENGINEER APPROVAL

All Structural Engineers designing foundation systems shall be 2-10 HBW approved professional engineers licensed in the state of Texas with a proven record of experience and qualifications in the areas of foundation engineering for expansive soils and collapsing soils. A minimum of five (5) years experience designing foundations in the soil conditions in Texas must be demonstrated for approval. Requirements and procedures to be placed on the 2-10 HBW approved list of engineers are described in Section 6.

4.3 ALL ENGINEERED FOUNDATION SYSTEMS

The following foundation systems and design requirements are to be utilized by 2-10 HBW approved engineers for soil conditions in Texas, including expansive, unstable or active soil conditions. 2-10 HBW Slabs I, I-C, II, II-C, III, III-C, and IV are engineered foundation designs and require completion of the structural plans by a 2-10 HBW approved engineer. 2-10 HBW also recommends but does not require that a 2-10 HBW approved engineer complete the structural plans for 2-10 HBW Slab IV-C designs. The foundation system or soil improvement method used in the construction of all homes or multi-family buildings proposed for enrollment in the 2-10 HBW Warranty Program will be determined by the Structural Engineer based on existing subsurface conditions as described in the Geotechnical Report prepared by an 2-10 HBW approved Geotechnical Engineer, knowledge of foundation construction on expansive, unstable or active soils, geographic region, and in accordance with the guidelines set forth in this Manual. Maximum unrestrained differential soil movement (y_m) values for the 2-10 HBW Slab types in this Manual were determined using the guidelines contained in Chapter 3 of the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition*. Structural engineers designing foundations using geotechnical reports not meeting the PTI 3rd edition guidelines should refer to Section 3.6.2 of this Manual.

Post-tensioned slab-on-ground foundation systems shall utilize high strength steel tendons to prestress concrete slab and beam foundations. The design of this foundation system must consider the superimposed loads from the structure above as well as specific geotechnical parameters used in post-tensioned design. The recommendations contained in the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* and the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1,* shall be utilized by a 2-10 HBW approved structural engineer for the design of this foundation system. Post-tensioned slab-on-ground foundation systems give special consideration to limit differential movement in the design of foundations constructed on sites with partial cut and/or partial fill of expansive or compressible soils. All fill that supports the load of the foundation shall be tested for proper compaction and strength. Pier and grade beam or other nonstandard foundations may be required on these sites to ensure satisfactory foundation performance. Retaining walls that will be used to support foundation loads must be designed and inspected by a 2-10 HBW approved engineer.

4.4 CENTRAL TEXAS STANDARD FOUNDATION SYSTEMS

The Central Texas Special Investigative Area includes all of Dallas and portions of Fort Worth, San Antonio, and Austin. In this area, thick clay deposits with high swell potential are prevalent, and climatic conditions are conducive to large volume changes. Particularly troublesome are clays contained in the Washita, Woodbine, Eagle Ford, Taylor, and Navarro formations.

There are a total of six (6) standardized foundation systems for the Central Texas Special Investigative Area. 2-10 HBW Slabs I, II, and III are post-tensioned slab-on-ground systems; 2-10 HBW Slabs I-C, II-C, and III-C are conventionally reinforced slab-on-ground foundations. The majority of home construction in this area will use one of these standardized foundation systems. Where site-specific soil or geological conditions preclude the use of a standardized foundation system, an alternative engineered foundation system such as pier and beam, or soil treatment methods, will be required.

4.4.1 Central Texas Minimum Design Requirements

The following minimum design configuration requirements shall be used in the design of all slab-on-ground foundations in Central Texas:

1. Minimum slab thickness shall be four inches (4"). Dimensional tolerance for individual locations is -½ inch to +2 inches. Dimensional tolerance for average thickness is -¼ inch to +1 inch.
2. Minimum perimeter beam width shall be ten inches (10").
3. Minimum concrete cover measured from the bottom of the beam to the reinforcing steel shall be four inches (4").
4. All exterior and interior beams are to be continuous between the edges of the foundation in both directions. To be considered continuous, beams shall be (a) continuous, or (b) overlap a parallel beam with adequate length and proximity so as to be effectively continuous.
5. All beams shall be founded not less than six inches (6") into undisturbed soil or soil compacted to a minimum of ninety-five percent (95%) Standard Proctor Density. Minimum beam penetration below final grade shall be twelve inches (12").

4.4.2 2-10 HBW Slab I

Application: Central Texas Special Investigative Area, $y_m \leq 1.0$ Inch or PI ≤ 22
Description: Post-Tensioned Slab-on-Ground Foundation

This standardized foundation design is the minimum design requirement for post-tensioned slab-on-ground construction in the Central Texas Special Investigative Area where geotechnical investigation indicates y_m is equal to or less than 1.0 inch. Engineers using Effective PI values should refer to Sections 3.6.2 and 3.6.3 of this Manual.

4.4.3 2-10 HBW Slab I Minimum Design Requirements

In addition to all Central Texas Minimum Design Requirements for slab-on-ground foundations described in Section 4.4.1 (items 1 through 5), the following design configuration requirements shall be used for 2-10 HBW Slab I foundations:

1. – 5. See Section 4.4.1, above.
6. Tendon spacing in the slab shall provide a minimum prestress force of seventy-five (75) psi or 0.075***A*** (kips).
7. Average beam spacing shall be no more than twelve feet (12'). Maximum beam spacing is fourteen feet (14').
8. Minimum beam depth shall be twenty-six inches (26").
9. Minimum beam reinforcement shall be one (1) tendon.
10. Minimum tendon size shall be one-half inch (1/2") diameter, grade (GR) 270, seven (7) wire strand.

The structural engineer must consider site-specific conditions and design parameters contained in the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* including e_m and y_m for edge lift and center lift modes. ***A*** is defined as the gross concrete cross section, in^2. Sites where geotechnical investigation indicates y_m greater than 1.0 inch (and not more than 2.0 inches) require 2-10 HBW Slab II, or soil treatment methods to reduce the soil movement potential to y_m of 1 inch or less. The PTI Design Manual is based on average climate controlled soil movements, and the design recommendations must also take into account the added effect of trees, bushes, irrigated landscape, and other environmental effects within the influence of the foundation.

4.4.4 2-10 HBW Slab I-C

Application: Central Texas Special Investigative Area, $y_m \leq$ 1.0 Inch or PI $\leq$ 22
Description: Conventionally Reinforced Slab-on-Ground Foundation

This standardized foundation design is used in areas of low to moderate swelling pressures, where y_m is 1.0 inch or less. Engineers using Effective PI values should refer to Sections 3.6.2 and 3.6.3 of this Manual.

Conventionally reinforced slab systems are constructed in contact with the ground and receive and transmit all structural loads of the building to the under slab bearing soils. This system may be described as a 4" thick slab with deeper grade beams required for foundation stiffness.

4.4.5 2-10 HBW Slab I-C Minimum Design Requirements

In addition to all Central Texas Minimum Design Requirements for slab-on-ground foundations described in Section 4.4.1 (items 1 through 5), the following design configuration requirements shall be used for 2-10 HBW Slab I-C foundations:

1. – 5. See Section 4.4.1, above.
6. Minimum slab reinforcement shall be one (1) -#4 Grade (GR) 60, eighteen inches (18") on center in both directions (length and width).
7. Average beam spacing shall be no more than twelve feet (12'). Maximum beam spacing is fourteen feet (14').
8. Minimum beam depth shall be twenty-six inches (26").
9. Minimum beam reinforcement shall be two (2) -#6 Grade (GR) 60 or equivalent placed at the top and bottom of the beam. All exterior corners and interior beams which dead end into exterior beams shall have corner bars.
10. Minimum lap splice length shall be 36 bar diameters. Minimum concrete cover measured from the bottom of the beam to the reinforcing steel shall be four inches (4").

Site-specific conditions may require a design in excess of the minimum. Sites where geotechnical investigation indicates y_m greater than 1.0 inch require 2-10 HBW Slabs II-C or III-C, or a soil improvement method to reduce the soil movement potential. All conventionally reinforced slab-on-ground foundations must be constructed under the applicable standards of the American Concrete Institute (ACI).

4.4.6 2-10 HBW Slab II

Application: Central Texas Special Investigative Area, y_m < 2.0 Inches or PI < 45
Description: Post-Tensioned Slab-on-Ground Foundation

This standardized foundation design is the minimum design requirement for slab-on- ground construction in the Central Texas Special Investigative Area where the geotechnical investigation indicates y_m is greater than 1.0 inch and no more than 2.0 inches. Engineers using Effective PI values should refer to Sections 3.6.2 and 3.6.3 of this Manual.

4.4.7 2-10 HBW Slab II Minimum Design Requirements

In addition to all Central Texas Minimum Design Requirements for slab-on-ground foundations described in Section 4.4.1 (items 1 through 5), the following design configuration requirements shall be used for Slab II foundations:

1. – 5. See Section 4.4.1, above.
6. Tendon spacing in the slab shall provide a minimum prestress force of seventy-five (75) psi or $0.075A$ (kips).

7. Average beam spacing shall be no more than eleven feet (11'). Maximum beam spacing is twelve feet (12').
8. Minimum beam depth shall be twenty-six inches (26").
9. Minimum beam reinforcement shall be two (2) tendons or one (1) tendon and two (2)-#4 Grade (GR) 60 or equivalent. All conventional reinforcing steel shall be placed at bottom of beam, minimum lap splice length shall be 36 bar diameters, and minimum cover from the bottom of the beam to the reinforcing steel shall be four inches (4").
10. Minimum tendon size shall be one-half inch (1/2") diameter, grade (GR) 270, seven (7) wire strand.

The structural engineer must consider site-specific conditions and design parameters contained in the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* including e_m and y_m for edge lift and center lift modes. ***A*** is defined as the gross concrete cross section, in^2. Sites where geotechnical investigation indicates y_m greater than 2.0 inches require 2-10 HBW Slab III, or soil treatment methods to reduce the soil movement potential to y_m of 2 inches or less. The PTI Design Manual is based on average climate controlled soil movements, and the design recommendations must also take into account the added effect of trees, bushes, irrigated landscape and other environmental effects within the influence of the foundation.

4.4.8 2-10 HBW Slab II-C

Application: Central Texas Special Investigative Area, $y_m \leq 2.0$ Inches or PI ≤ 45
Description: Conventionally Reinforced Slab-on-Ground Foundation

This standardized foundation design is used in areas of low to moderate swelling pressures, where y_m is 2.0 inches or less. Engineers using Effective PI values should refer to Sections 3.6.2 and 3.6.3 of this Manual.

Conventionally reinforced slab systems are constructed in contact with the ground and receive and transmit all structural loads of the building to the under slab bearing soils. This system may be described as a 4" thick slab with deeper grade beams required for foundation stiffness.

4.4.9 2-10 HBW Slab II-C Minimum Design Requirements

In addition to all Central Texas Minimum Design Requirements for slab-on-ground foundations described in Section 4.4.1 (items 1 through 5), the following design configuration requirements shall be used for 2-10 HBW Slab II-C foundations:

1. - 5. See Section 4.4.1.
6. Minimum slab reinforcement shall be one (1)-#4 Grade (GR) 60, eighteen inches (18") on center in both directions (length and width).

7. Average beam spacing shall be no more than eleven feet (11'). Maximum beam spacing is twelve feet (12').
8. Minimum beam depth shall be twenty-six inches (26").
9. Minimum beam reinforcement shall be two (2) - #6 Grade (GR) 60 or equivalent placed at the top and bottom of beam, with #4 stirrups sixteen inches (16") on center. All exterior corners and interior beams which dead end into exterior beams shall have corner bars.
10. Minimum lap splice length shall be 36 bar diameters. Minimum concrete cover from the bottom of the beam to the reinforcing steel shall be four inches (4").

Sites where the geotechnical investigation indicates y_m greater than 2.0 inches require 2-10 HBW Slab III-C, or a soil improvement method to reduce the soil movement potential to y_m of 2 inches or less. All conventionally reinforced slab-on-ground foundations must be constructed under the applicable standards of the American Concrete Institute (ACI).

4.4.10 2-10 HBW Slab III

Application: Central Texas Special Investigative Area, $y_m \leq 3.0$ Inches or PI ≤ 65
Description: Deep Beam Post-Tensioned Slab-on-Ground Foundation

This standardized foundation design is the minimum design requirement for slab-on-ground construction in Central Texas where the geotechnical investigation indicates y_m is greater than 2.0 inches but not more than 3.0 inches. Engineers using Effective PI values should refer to Sections 3.6.2 and 3.6.3 of this Manual.

4.4.11 2-10 HBW Slab III Minimum Design Requirements

In addition to all Central Texas Minimum Design Requirements for slab-on-ground foundations described in Section 4.4.1. (items 1 through 5), the following design configuration requirements shall be used for 2-10 HBW Slab III foundations:

1. – 5. See Section 4.4.1, above.
6. Tendon spacing in the slab shall provide a minimum prestress force of seventy-five (75) psi or $0.075A$ (kips).
7. Average beam spacing shall be no more than ten feet (10'). Maximum beam spacing is twelve feet (12').
8. Minimum beam depth shall be thirty-four inches (34").
9. Minimum beam reinforcement shall be two (2) tendons or one (1) tendon and two (2) -#4 Grade (GR) 60 or equivalent. All conventional reinforcing steel shall be placed at bottom of beam, minimum lap splice length shall be 36 bar diameters, and minimum cover from the bottom of the beam to the reinforcing steel shall be four inches (4").
10. Minimum tendon size shall be one-half inch (1/2") diameter, grade (GR) 270, seven (7) wire strand.

The structural engineer must consider site specific conditions and design parameters contained in the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* including e_m and y_m for edge lift and center lift modes. ***A*** is defined as the gross concrete cross section, in^2. Sites where the geotechnical investigation indicates y_m greater than 3.0 inches require a design in excess of the minimum and/or soil treatment methods to reduce the soil movement potential to y_m of 3 inches or less. The PTI Design Manual is based on average climate controlled soil movements, and the design recommendations must also take into account the added effect of trees, bushes, irrigated landscape and other environmental effects within the influence of the foundation.

4.4.12 2-10 HBW Slab III-C

Application: Central Texas Special Investigative Area, $y_m \leq 3.0$ Inches or PI ≤ 65
Description: Conventionally Reinforced Slab-on-Ground Foundation

This standardized foundation design is used in areas of moderate swelling pressures, where y_m is 3.0 inches or less. Engineers using Effective PI values should refer to Sections 3.6.2 and 3.6.3 of this Manual.

Conventionally reinforced slab systems are constructed in contact with the ground and receive and transmit all structural loads of the building to the under slab bearing soils. This system may be described as a 4" thick slab with deeper grade beams required for foundation stiffness.

4.4.13 2-10 HBW Slab III-C Minimum Design Requirements

In addition to all Central Texas Minimum Design Requirements for slab-on-ground foundations described in Section 4.4.1 (items 1 through 5), the following design configuration requirements shall be used for 2-10 HBW Slab III-C foundations:

1. - 5. See Section 4.4.1.
6. Minimum slab reinforcement shall be one (1)-#4 Grade (GR) 60, eighteen inches (18") on center in both directions (length and width).
7. Average beam spacing shall be no more than ten feet (10'). Maximum beam spacing is twelve feet (12').
8. Minimum beam depth shall be thirty-four inches (34").
9. Minimum beam reinforcement shall be three (3) - #6 Grade (GR) 60 or equivalent placed at the top and bottom of beam, with #4 stirrups sixteen inches (16") on center. All exterior corners and interior beams which dead end into exterior beams shall have corner bars.
10. Minimum lap splice length shall be 36 bar diameters. Minimum concrete cover from the bottom of the beam to the reinforcing steel shall be four inches (4").

Sites where geotechnical investigation indicates y_m greater than 3.0 inches require a design in excess of the minimum and/or soil treatment methods to reduce the soil movement potential to y_m of 3 inches or less. All conventionally reinforced slab-on-ground foundations must be constructed under the applicable standards of the American Concrete Institute (ACI).

4.5 STANDARD FOUNDATION SYSTEMS ALL AREAS (EXCEPT CENTRAL)

Subsurface conditions underlying the state of Texas are diverse. There are two (2) standardized foundation types for all areas of Texas outside of the Central Texas Special Investigative Area. 2-10 HBW Slab IV is a post-tensioned slab-on- ground; and 2-10 HBW Slab IV-C is a conventionally reinforced slab-on-ground. The majority of home construction outside of Central Texas will use one of these standardized foundation types. Where expansive soils, geological hazards, slopes, cut, fill, or other site specific conditions preclude the use of one of the standardized foundation systems, (one of the three Central Texas 2-10 HBW foundation systems), an alternative engineered foundation system such as pier and beam, or soil improvement methods will be required.

4.5.1 Minimum Design Requirements for All Areas (Except Central)

The following minimum design configuration requirements shall be used in the design of all slab-on-ground foundations in Texas (outside of the Central Texas Special Investigative Area):

1. Minimum slab thickness shall be four inches (4"). Dimensional tolerance for individual locations is -½ inch to +2 inches. Dimensional tolerance for average thickness is -¼ inch to +1 inch.
2. Minimum beam depth shall be twenty-four inches (24").
3. Minimum perimeter beam width shall be ten inches (10").
4. Minimum concrete cover measured from the bottom of the beam to the reinforcing steel shall be four inches (4").
5. Average beam spacing shall be not more than fifteen feet (15') apart; or beams shall be located under all interior load-bearing partitions and concentrated loads such as fireplaces and columns with a maximum beam spacing of twenty-five feet (25').
6. All beams shall be founded not less than six inches (6") into undisturbed soil or soil compacted to a minimum of ninety-five percent (95%) Standard Proctor Density. Minimum beam penetration below final grade shall be twelve inches (12").

4.5.2 2-10 HBW Slab IV

Application: All of Texas except Central, y_m < 1.0 Inch or PI ≤ 15
Description: Post-Tensioned Slab-on-Ground Foundation

This standardized foundation design is used in areas of low swelling pressures, where y_m is less than 1.0 inch or where the plasticity index (PI) of the soil is equal to or less than fifteen (15), and with residential construction that is simple in design and which exerts relatively light loads on the foundation systems. Post-tensioned slab-on-ground foundation systems utilize high strength steel tendons to prestress concrete slab and beam foundations. The design of this foundation system must consider the superimposed loads from the structure above as well as specific geotechnical parameters used in post-tensioned design. The recommendations contained in the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* and the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1,* shall be utilized by a 2-10 HBW approved structural engineer for the design of this foundation system.

4.5.3 2-10 HBW Slab IV Minimum Design Requirements

In addition to the Minimum Design Requirements for slab-on-ground foundations in all areas of Texas (except Central) described in Section 4.5.1. (items 1 through 6), the following design configuration requirements shall be used for Slab IV foundations:

1. – 6. See Section 4.5.1, above.
7. Tendon spacing in the slab shall provide a minimum prestress force of seventy-five (75) psi or 0.075***A*** (kips).
8. Minimum beam reinforcement shall be one (1) tendon.
9. Minimum tendon size must be one-half inch (½") diameter, grade (GR) 270, seven (7) wire strand.
10. All exterior and interior beams are to be continuous between the edges of the foundation in both directions. To be considered continuous, beams shall be (a) continuous, or (b) overlap a parallel beam with adequate length and proximity so as to be effectively continuous.

The structural engineer must consider site-specific conditions and design parameters contained in the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* including e_m and y_m for edge lift and center lift modes. ***A*** is defined as the gross concrete cross section, in^2. Sites where geotechnical investigation indicates y_m greater than 1.0 inch will require 2-10 HBW Slabs II or III, or soil treatment methods to reduce the soil movement potential to less than 1.0 inch.

4.5.4 2-10 HBW Slab IV-C

Application: All of Texas except Central, y_m < 1.0 Inch or PI ≤ 15
Description: Conventionally Reinforced Slab-on-Ground Foundation

This standardized foundation design is used in areas of low swelling pressures, where y_m is less than 1.0 inch or where the plasticity index (PI) of the soil is equal to or less than fifteen (15), and with residential construction that is simple in design and which exerts relatively light loads on the foundation systems. All conventionally reinforced slab-on-ground foundations must be constructed under the applicable standards of the American Concrete Institute (ACI). Conventionally reinforced slab systems are constructed in contact with the ground and receive and transmit all structural loads of the building to the under slab bearing soils. This system may be described as a 4" thick slab with deeper grade beams located under load bearing walls or as required for foundation stiffness. 2-10 HBW recommends that this slab design be engineered; however, this is not a requirement.

4.5.5 2-10 HBW Slab IV-C Minimum Design Requirements

In addition to the Minimum Design Requirements for slab-on-ground foundations in all areas of Texas (except Central) described in Section 4.5.1. (items 1 through 6), the following design configuration requirement shall be used for Conventionally Reinforced Slab foundations:

1. – 6. See Section 4.5.1.
7. Minimum slab reinforcement shall be one (1) -#3 Grade (GR) 60, eighteen inches (18") on center in both directions (length and width).
8. Minimum beam reinforcement shall be two (2) -#5 Grade (GR) 60 or equivalent placed at bottom of beam. All exterior corners and interior beams which dead end into exterior beams shall have corner bars or lap intersecting bars.
9. Minimum lap splice length shall be 36 bar diameters. Minimum concrete cover measured from the bottom of the beam to the reinforcing steel shall be four inches (4").
10. Reentrant corners and other geometric irregularities (such as fireplaces or bay windows) with more than eighteen inches (18") of offset must be stiffened by two (2) -#3 Grade (GR) 60, a minimum of three feet (3') in length placed diagonally in the slab at the reentrant corner.

Site-specific conditions may require a design in excess of the minimum. Where geotechnical investigation indicates y_m greater than 1.0 inches, 2-10 HBW Slabs II-C or III-C, or soil improvement method to reduce the soil movement potential to less than 1.0 inch, is required.

4.5.6 All Areas (Except Central Texas) with y_m > 1.0 Inch

All sites where geotechnical investigation indicates y_m greater than 1.0 inch require a stiffer slab to prevent edge-lift damage caused by soil movement. Central Texas 2-10 HBW Slabs II, II-C, III or III-C may be utilized outside of Central Texas for sites with higher soil movement potential in accordance with the design requirements described in Sections 4.4.1, and 4.4.6 through 4.4.13. Alternatively, soil improvement methods may be utilized to reduce the soil movement potential; or a nonstandard foundation type may be recommended.

4.6 NONSTANDARD FOUNDATION TYPES ALL AREAS

2-10 HBW standardized foundation systems are not intended for sites where the geotechnical investigation indicates surface or near surface soils are unsuitable for bearing purposes, including soft, compressible soils, or highly expansive soils where y_m is greater than 3.0 inches. Where soils are non-expansive, but unsuitable for bearing purposes, a "deep foundation" is required. Deep foundations use piles or piers to transfer the load to a deeper, more competent strata, and must be designed by a licensed and 2-10 HBW approved engineer. Pier and Beam foundations shall meet all applicable Building Code requirements, including the minimum requirements contained in Section 1812 of the *2003 International Building Code* published by the International Code Council, and ACI 543R-00 *Design, Manufacture, and Installation of Concrete Piles* by the American Concrete Institute. In addition, any slab supported by driven piles, piers, or other deep foundation elements, must meet the minimum guidelines for 2-10 HBW Slab II or II-C. Sites having highly expansive soils with y_m greater than 3.0 inches require a nonstandard foundation, designed by licensed and 2-10 HBW approved engineers in accordance with the guidelines contained in this Section. As an alternative to using a deep or nonstandard foundation, geotechnical engineer may specify excavation and removal of unsuitable soils, replacement with compacted, structural fill, or an approved soil treatment method to reduce the soil movement potential to y_m of 3.0 inches or less.

4.6.1 Pier and Beam Foundation

Application: Central Texas Special Investigative Area y_m > 3.0 inches, All Other Areas with Expansive Soils utilizing this Nonstandard Design
Description: Poured-in-Place Concrete Pier and Beam Foundation
Additional Requirements: Independent Peer Review if y_m > 3.0 inches

Pier and beam foundation systems may be used in higher-end home construction, when surface or near surfaces soils cannot support the imposed foundation loads, sites with pronounced slopes, or sites with highly expansive soils where y_m is greater than 3.0 inches. These soil conditions may include expansive in situ soil or may be due to uncontrolled or improperly placed fill. This foundation system utilizes drilled straight shaft or under reamed piers and foundation beams to support the loads of the structure. Floor system will be suspended structurally above the

surface soil, and may be constructed using steel or wood framing with interior beams supporting floor assembly of either wood or steel. There will be a "crawl space" underneath. For sites having soft, compressible soils, fill, or pronounced slopes, the geotechnical engineer should provide recommendations for pier depth that takes into account possible lateral movements as well as the normal downward movement due to gravity loads.

These minimum guidelines shall be followed for all residential construction using small diameter drilled piers in expansive soils. 2-10 HBW approved structural engineers designing pier and beam foundations shall consider bearing capacity of piers, minimum reinforcement to resist tension forces, and minimum depth of piers below the moisture active soil zone for adequate resistance to uplift forces. The recommendations for pier foundations contained in Section 1812 of the *2003 International Building Code* published by the International Code Council, and ACI 543R-00 *Design, Manufacture, and Installation of Concrete Piles* by the American Concrete Institute, shall be referred to in the design of this foundation system. When construction varies from the structural plans, any structural elements affected by the construction variations shall be investigated, reviewed and reported by the engineer of record. If alterations or repairs are necessary, the engineer of record shall design and inspect those items and provide certification to 2-10 HBW. The following minimum design configuration requirements shall be used for the design of pier and beam foundations where soils are expansive:

1. Drilled Piers: Minimum pier length shall be to the depth specified by the geotechnical engineer or refusal as verified by the geotechnical engineer. Minimum area of reinforcing steel used in each drilled pier shall be equivalent to one (1) -#8, Grade 60 bar or one percent (1%) of the pier area at Grade 60, whichever is greater. The structural engineer may require additional reinforcing steel to resist uplift forces on the pier. If a single bar or two bars are used, they shall be placed in the center of the circular pier. If more than two bars must be used in a pier to achieve the equivalent steel area, lateral ties consisting of #3 ties spaced a maximum of twenty-four (24") on center, or as specified by the structural engineer, shall be required.
2. Grade Beam Reinforcement: Grade Beams must be properly designed to resist the required lateral loads as specified in the Geotechnical Report as well as the required vertical design loads. Resistance to lateral loads will be accomplished by the use of reinforcing steel or other means designed by the structural engineer.
3. Foundation Voids: Foundation voids, where required, will be as specified by the geotechnical or structural engineer.
4. Foundation Drains: Foundation drain systems, where required, will be as specified by the geotechnical or structural engineer.
5. Slab-On-Grade Isolation: Garage slabs not cast as part of the foundation shall be "free floating". Slabs shall be separated from foundation walls by a minimum of one inch (1") of expansion joint material.

6. Steel Columns: Adjustable steel monoposts shall be installed whenever interior piers and columns are required to support interior floor systems. Adjustment shall be a minimum of one inch (1") and a maximum of three inches (3").
7. Clearance under Framing: All wood framing shall have a clearance above the subgrade as required by the *International Residential Code.*
8. Exterior Columns for Overhangs: Exterior columns for overhangs on porches, balconies and decks must be isolated from porch and patio slabs if expansive soils are present. These columns must be isolated from the slab and bear on a grade beam or pier designed to support the loads. Any veneer used must be isolated from porch or patio slabs and supported by the engineered foundation system. If a porch slab is designed as a structural slab with foundations similar to those of the house, columns supported by the structural slab are not required to be isolated.
9. Structural Plans: Structural plans must include specific details such as voids between grade beam and soil, isolation of columns, foundation steel placement, beam pockets, and other details. Plans shall show the location of all reinforcing steel, including any wall openings and at beam pockets.

Foundations designed for homes constructed on lots where geotechnical investigation indicates y_m greater than 3 inches, or other soil or geological conditions that require a pier and grade beam foundation, must be submitted by a 2-10 HBW approved design engineer for independent engineering peer review. The design engineer should contact 2-10 HBW for list of engineers approved by 2-10 HBW Risk Management and NHIC for peer review. Cost of peer review will be borne by design engineer. 2-10 HBW and NHIC reserve the right, in their sole discretion, to require additional detailed geotechnical investigation to aid in site consideration, and examine, audit, and determine the acceptability of all foundation designs developed.

4.6.2. Pier Supported Slab Foundations

Application: Central Texas Special Investigative Area y_m > 3.0 Inches, All Other Areas with Expansive Soils utilizing this Nonstandard Design
Description: Poured-in-Place Concrete Pier and Structural Slab Foundation
Additional Requirements: Independent Peer Review if y_m > 3.0 Inches

Pier supported conventionally reinforced structural slab or post-tensioned foundations are used when surface or near surface soils cannot support the imposed foundation loads, or sites having highly expansive soils where y_m is greater than 3.0 inches. These soil conditions may include expansive in situ soil or may be due to uncontrolled or improperly placed fill. Pier supported slab foundations may be referred to as "deep foundations", i.e. piers transfer the loading to a deeper, more competent strata if unsuitable soils are present near the surface. Straight shaft or under reamed concrete piers may be used to penetrate the weak or highly expansive soil layers. For sites with soft, compressible soils,

fill, or pronounced slopes, the geotechnical engineer should provide recommendations for pier depth that takes into account possible lateral movements as well as the normal downward movement due to gravity loads.

These minimum guidelines shall be followed for all residential construction using small diameter drilled piers in expansive soils. 2-10 HBW approved structural engineers designing pier supported slab foundations shall consider bearing capacity of piers, minimum reinforcement to resist tension forces, and minimum depth of piers below the moisture active zone to resist uplift forces. The recommendations for pier foundations contained in Section 1812 of the *2003 International Building Code* published by the International Code Council, and ACI 543R-00 *Design, Manufacture, and Installation of Concrete Piles* by the American Concrete Institute, shall be referred to in the design of this foundation system. When construction varies from the structural plans, any structural elements affected by the construction variations shall be investigated, reviewed and reported by the engineer of record. If alterations or repairs are necessary, the engineer of record shall design and inspect those items and provide certification to 2-10 HBW. The following minimum design configuration requirements shall be used for the design of pier supported slab foundations where soils are expansive:

1. Drilled Piers: Minimum pier length shall be to depth specified by the geotechnical engineer or refusal as verified by the geotechnical engineer. Minimum area of reinforcing steel used in each drilled pier shall be equivalent to one (1) -#8, Grade 60 bar or 1% of the pier area at Grade 60, whichever is greater. The structural engineer may require additional reinforcing steel to resist uplift forces on the pier. If a single bar or two bars are used, they shall be placed in the center of the circular pier. If more than two bars must be used in a pier to achieve the equivalent steel area, lateral ties consisting of #3 ties spaced a maximum of twenty-four inches (24") on center, or as specified by the structural engineer, shall be required.
2. Voids: Void boxes, where required, will be as specified by the geotechnical or structural engineer.
3. Slab Design: All pier supported slabs shall at a minimum meet the design configuration requirements used for 2-10 HBW Slab II or II-C foundations.
4. Structural Plans: Structural plans must include specific details such as voids between slab and soil, location and type of all reinforcing steel, and other details.

4.7 GUIDELINES FOR ENGINEERED FOUNDATION SYSTEMS

These minimum guidelines shall be followed on all homes proposed for enrollment in the 2-10 HBW Warranty Program in Texas. All engineered foundation systems shall be designed, and plans prepared by, a registered structural engineer who has been approved by 2-10 HBW and NHIC's Risk Management Department and whose name appears on the 2-10 HBW list of approved structural engineers.

When construction varies from the structural plans, any structural elements affected by the construction variations shall be investigated, reviewed and reported by the engineer of record. If alterations or repairs are necessary, the engineer of record shall design and inspect those items and provide certification to 2-10 HBW.

4.7.1 Structural Plans

Structural plans may be required by 2-10 HBW or NHIC. All structural plans submitted to 2-10 HBW or NHIC must include specific details such as concrete coverage of reinforcing steel, post-tension tendon placement details, location of all reinforcing steel and any special conditions existing for the specific building site.

SECTION 5

TEXAS INSPECTION GUIDELINES

5.1 CONSTRUCTION INSPECTIONS

Mandatory inspections that are required to meet enrollment requirements of the 2-10 HBW Warranty Program as listed in this Section 5 must be conducted by (a) 2-10 HBW approved engineers, or (b) 2-10 HBW fee inspectors, or (c) local building departments, or (d) where available 2-10 HBW staff inspectors. In some cases, certain designated building departments may not conduct inspections for 2-10 HBW homes. In those cases, 2-10 HBW approved engineers or fee inspectors must be used by builders. 2-10 HBW or NHIC staff inspectors may also perform these inspections, subject to availability.

An inspection is defined, for the purposes of these guidelines, as a critical appraisal by closely viewing, by physical measurements and/or observations, of construction in progress or completed construction to make a professional judgment concerning compliance with the construction plans and specifications, 2-10 HBW guidelines, and the jurisdictional Building Code for the area of construction. The type of foundation and other requirements designated by the geotechnical engineer will determine which construction inspections will be needed. If more than one foundation type (a mixed foundation) is used for the individual site, all applicable inspections will be required.

Compliance with the provisions contained herein is the responsibility of the builder, engineer, and fee inspector. Neither 2-10 HBW nor NHIC make any warranty, express or implied, regarding the results of any inspection, or that the home was inspected in accordance with the guidelines contained herein. 2-10 HBW or NHIC may in their sole discretion approve or reject any home proposed to be enrolled in the 2-10 HBW Warranty Program.

5.2 MANDATORY FOUNDATION INSPECTIONS

The mandatory inspections that are required to meet 2-10 HBW's and NHIC's Risk Management requirements for typical foundations are shown below as well as the required inspectors. If the foundation is constructed within a building department jurisdiction that is approved for certain inspections, the building department's inspections will be accepted for the inspections indicated.

5.2.1 2-10 HBW Slabs I, II, III, and IV

This standard foundation system utilizes a stiffened slab and beam foundation reinforced with high strength steel tendons. At a minimum, foundation inspections shall be in accordance with Section 6 *of* the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1,* and the current standard practices of geotechnical engineers in the state of Texas. Structural plans shall be available for the inspector on site. Inspection form or "ticket" shall indicate which 2-10 HBW Slab, I, II, III, or IV, was used.

	INSPECTOR
A) Foundation Pre-pour	Engineer Staff/Fee Insp
B) Tensioning Certification	Engineer

5.2.2 2-10 HBW Conventionally Reinforced Slab I-C, II-C, and III-C

This standard foundation system for Central Texas utilizes a stiffened slab and beam foundation reinforced with deformed reinforcing steel. Structural plans shall be available for the inspector on site. Inspection forms or "tickets" completed by 2-10 HBW approved engineers or fee inspectors shall indicate foundation is a 2-10 HBW Slab I-C, II-C, or III-C design.

	INSPECTOR
A) Foundation Pre-pour	Engineer Staff/Fee Insp

5.2.3 2-10 HBW Conventionally Reinforced Slab IV-C

This standard foundation system for all areas of Texas except Central utilizes a stiffened slab and beam foundation reinforced with deformed reinforcing steel. Inspection forms or "tickets" completed by 2-10 HBW approved engineers or fee inspectors shall indicate foundation is a 2-10 HBW Slab IV-C design.

	INSPECTOR
A) Foundation Pre-pour	Engineer Staff/Fee Insp Bldg. Dept.

5.2.4 Pier and Beam

This nonstandard foundation system is drilled circular holes that are then reinforced with steel bars and filled with concrete. Either concrete or wooden beams are then supported by these piers. If poured in place concrete beams are used, an additional inspection is required. Structural plans shall be available for the inspector on site.

	INSPECTOR
A) Pier Drilling and Reinforcing Steel	Engineer Staff/Fee Insp
B) Concrete Beams	Engineer Staff/Fee Insp
C) Floor Framing	Engineer Staff/Fee Insp Bldg. Dept.

5.2.5 Reinforced Structural Slab / Piers

This nonstandard foundation system is drilled circular holes that are then reinforced with steel bars and then filled with concrete. A conventionally reinforced stiffened slab is then supported on the piers. Structural plans shall be available for the inspector on site.

	INSPECTOR
A) Pier Drilling and Reinforcing Steel	Engineer Staff/Fee Insp
B) Slab Pre-pour	Engineer Staff/Fee Insp Bldg. Dept.

5.2.6 Post-Tensioned Slab / Piers

This nonstandard foundation system is drilled circular holes that are then reinforced with steel bars and then filled with concrete. A Post-Tensioned stiffened slab is then supported by these piers. Structural plans shall be available for the inspector on site.

	INSPECTOR
A) Pier Drilling and Reinforcing Steel	Engineer Staff/Fee Insp
B) Slab Pre-pour	Engineer Staff/Fee Insp
C) Tensioning Certification	Engineer

5.2.7 Engineered Foundation / Basement/ Piers

This nonstandard foundation system is drilled circular holes that are then reinforced with steel bars and filled with concrete. Grade beams or foundation walls are then supported on the piers. Voids are placed beneath the grade beam or foundation wall to prevent swelling soils from pushing the beam or wall upward.

	INSPECTOR
A) Pier Drilling and Reinforcing Steel	Engineer Staff/Fee Insp
B) Foundation Wall and Foundation Voids	Engineer Staff/Fee Insp
C) Basement Slab	Engineer Staff/Fee Insp
D) Foundation drain (as required)	Engineer Staff/Fee Insp

5.3 MANDATORY CONSTRUCTION INSPECTIONS

In addition to foundation inspections, other mandatory construction inspections required by 2-10 HBW Risk Management are shown below as well as the required inspectors.

An inspection is defined, for the purposes of these guidelines, as a critical appraisal by closely viewing, by physical measurements and/or observations, of construction in progress or completed construction to make a professional judgment concerning compliance with the construction plans and specifications, 2-10 HBW guidelines, and one of the Model Building Codes.

5.3.1 Original Construction Elevations

As defined in §304.1(c)(13) the Texas Residential Construction Commission Limited Statutory Warranty and Building and Performance Standards, Original Construction Elevations ("OCE") are actual elevations of the foundation taken prior to substantial completion of the residential construction project. Substantial completion means that all exterior walls, interior walls, and roof; are complete. This includes completion of brick veneer, stucco, siding, tile, roof shingles, and drywall finishes. Such actual elevations shall include elevations of porches and garages if those structures are part of a monolithic foundation.

To establish original construction elevations, elevations shall be taken at a rate of one elevation per one hundred square feet (100 ft^2) showing a reference point, subject to obstructions. Each elevation shall describe the floor, which will be the slab surface for 2-10 HBW Slabs I, I-C, II, II-C, III, III-C, IV, and IV-C, and the first floor surface for pier and beam foundations.

	INSPECTOR
A) Original Construction Elevation.....	Engineer Reg. Surveyor Certified Fee Insp

Original Construction Elevations are required on any home where the habitable areas of the home appear to be more than +/- 0.75 inch out of level. Original Construction Elevations are recommended on all homes to confirm habitable areas of home are level to +/- 0.75 inch, but are not required.

Original Construction Elevations are not required on triplexes, townhouses, or any multi-family building.

5.3.2 Elevation Inspection

Builders not completing OCE on all homes will have an Elevation Inspection on no less than 30% of builder's enrollments. The Elevation Inspection is a check for relative levelness to verify habitable areas of home appear to be level to +/- 0.75 inch over the length of the foundation, but is not intended to meet the Texas Residential Construction Commission Limited Statutory Warranty and Building and Performance Standards for Original Construction Elevations. Builders should contact Inspector or 2-10 HBW no later than five days prior to installation of carpet or other floor finishes to allow for an Elevation Inspection. Elevation Inspections will not be scheduled; random selection by 2-10 HBW will determine which homes have an Elevation Inspection. Homes that appear to be level +/- 0.75 inch will pass the Elevation Inspection. Homes identified by the Elevation Inspection as being more than +/- 0.75 inch out of level require Original Construction Elevations that conform to §304.1(c)(13) of the Texas Residential Construction Commission Limited Statutory Warranty and Building and Performance Standards.

	INSPECTOR
A) Elevation Inspection.....	Engineer Reg. Surveyor Certified Fee Insp

Builders not completing Original Construction Elevations on all homes should contact 2-10 HBW immediately if the habitable areas of the any home appear to be more than +/- 0.75 inch out of level. Original Construction Elevations will be required by and submitted to 2-10 HBW on that home. If builder did not contact 2-10 HBW and home is found more than +/- 0.75 inch out of level as the result of a random 2-10 HBW Elevation Inspection, OCE will be required on all homes constructed by builder and proposed for enrollment in 2-10 HBW Warranty Program for a period of no less than six (6) months. After six (6) months and provided builder has demonstrated from OCE submitted to 2-10 HBW that the

foundations for the habitable areas of all homes are level to +/- 0.75 inch over the length of the foundation, OCE will not be required. If Original Construction Elevations indicate any home proposed for enrollment in the 2-10 HBW Warranty Program is not level to +/- 0.75 inch, Builder will be required to continue to submit an OCE on each home until such time as 2-10 HBW and NHIC determine that builder is meeting this standard. 2-10 HBW and NHIC reserve the right, to determine which homes proposed for enrollment require OCE or Elevation Inspection, and in their sole discretion, to require or independently confirm OCE on any home proposed to be enrolled in the 2-10 HBW Warranty Program.

Elevation Inspections are not required on triplexes, townhouses, or any multi-family building.

5.3.3 Framing, Electrical, Mechanical and Plumbing

	INSPECTOR
A) Rough-In includes framing, electrical, mechanical and plumbing	Fee Inspector Bldg. Dept.
B) Final includes electrical, plumbing, mechanical and workmanship	Fee Inspector Bldg. Dept.

5.3.4 Final Grade Inspection and Certificate

This inspection is required on all homes or multi-family buildings constructed in the Central Texas Special Investigative Area, and all homes constructed anywhere in Texas where geotechnical investigation indicates y_m greater than 1.0 inch and which require 2-10 HBW Slab II, II-C, III, or III-C, or nonstandard foundation type. The inspection is to ensure positive drainage away from the foundation. All final grade inspection documentation submitted to 2-10 HBW must identify the individual home or building, and state that the home or building is in compliance with all 2-10 HBW Final Grade requirements. See Section 3.11 for special drainage guidelines and Section 5.4.6 for final grade inspection details.

	INSPECTOR
A) Final Grade	Staff/Fee Insp Engineer Reg. Surveyor

Note: Where weather has delayed the completion of final grading, the final grade inspection will not be required to in order to issue the Certificate of Warranty coverage. Where weather delayed the completion of final grading, final grade inspection shall be submitted to 2-10 HBW within ninety (90) days of the Effective Date of Warranty.

5.3.5 2-10 HBW Final Workmanship

This inspection is required on a pre-established number of residences completed by a builder or when the last final inspection performed on a house is more than 6 months old.

	INSPECTOR
A) Final Workmanship	Staff/Fee Insp Engineer

5.4 INSPECTION DETAILS

5.4.1 2-10 HBW Slabs I, II, III, and IV (Pre-pour)

Inspection to be completed when all formwork is complete and all post-tensioning tendons and reinforcing steel is in place and ready for placement of concrete.

A. Requirements for the Builder:
   (1) Site specific foundation plan must be on the jobsite.
   (2) String lines must be in place, one in each direction, across the foundation at finished floor elevation.

B. Required Inspection Procedures:
   (1) Review the foundation plan to ensure that it is for the specific site and is signed, sealed and dated by the engineer of record.
   (2) After reviewing the foundation plan check:
      (a) Form boards to ensure proper bracing to prevent movement during concrete placement. Brick ledges are installed according to the foundation plan.
      (b) Finished floor elevation to ensure that adequate drainage can be provided for the finished foundation.
      (c) Utility trenches entering under the foundation beams are properly blocked with clay blocks.
      (d) All copper plumbing lines which will be in contact with concrete have been properly sleeved in order to protect it from contact with any concrete.
      (e) All plumbing block-out boxes have adequate clearance from any reinforcing steel or form boards.
      (f) Slab thickness, utilizing the string lines and specified vapor barrier is in place.
      (g) Beams for proper width, depth and location. Beam bottoms must be clean and free of all loose material, roots, trash, and water.

(h) Beams for bearing at least six inches (6") into undisturbed soil or as noted on foundation plan. Note the location of any fill on the site that is used to support the foundation.
(i) Slab post-tensioning tendons for spacing, location, chairs (each chair must be wire tied), support at beam intersections and plastic cover completely covers all tendons. Tendons must be properly separated from all plumbing, block-outs and form boards.
(j) Beam post-tensioning tendons for location, drape, and anchorage.
(k) All tendons for proper live and dead end anchorage and pocket former placement.
(l) Reinforcing steel for proper size, grade, location and clearance from soil and utility lines. Reinforcing steel must be properly supported to prevent displacement during concrete placement. All reinforcing steel must be clean and free of mud or other deleterious matter.

5.4.2 2-10 HBW Slabs I, II, III, and IV (Tensioning Certification)

Inspection to be completed during the stressing operation on all post-tensioned slab-on-grade foundations.

A. Requirements for the Builder:
(1) Site specific foundation plan must be on the jobsite.

B. Required Inspection Procedures:
(1) Review the foundation plan to ensure that it is for the specific site and is signed, sealed and dated by the engineer of record.
(2) After reviewing the foundation plan check:
(a) Stressing force applications through gage pressure readings and/or tendon elongation.
(b) Tendon force indicated by gage pressure readings compares within ten percent (10%) of the tendon force indicated by tendon elongation.
(c) All tendons are stressed prior to cutting and grouting operations.
(d) Any deviations are reported to the engineer of record and 2-10 HBW.

5.4.3 2-10 HBW Slabs I-C, II-C, III-C, and IV-C (Conventionally Reinforced)

Inspection to be completed when all formwork is complete and all reinforcing steel is in place and ready for placement of concrete.

A. Requirements for the Builder:
(1) Site specific foundation plan must be on the jobsite (except IV-C).
(2) String lines must be in place, one in each direction, across the foundation at finished floor elevation.

B. Required Inspection Procedures:

(1) Review the foundation plan to ensure that it is for the specific site and is signed, sealed and dated by the engineer of record (except IV-C).

(2) After reviewing the foundation plan check:

(a) Form boards to ensure proper bracing to prevent movement during concrete placement. Brick ledges are installed according to the foundation plan.

(b) Finished floor elevation to ensure that adequate drainage can be provided for the finished foundation.

(c) Utility trenches entering under the foundation beams are properly blocked with clay blocks.

(d) All copper plumbing lines which will be in contact with concrete have been properly sleeved in order to protect it from contact with any concrete.

(e) All plumbing block-out boxes have adequate clearance from any reinforcing steel or form boards.

(f) Slab thickness, utilizing the string lines and specified vapor barrier is in place.

(g) Beams for proper width, depth and location. Beam bottoms must be clean and free of all loose material, roots, trash, and water.

(h) Beams for bearing at least six inches (6") into undisturbed soil or as noted on the foundation plans. Note the location of any fill on the site that is used to support the foundation.

(i) Reinforcing steel for proper size, grade, location and clearance from soil and utility lines. Reinforcing steel must be properly supported to prevent displacement during concrete placement. All reinforcing steel must be clean and free of mud or other deleterious matter.

5.4.4 Nonstandard Foundation Systems - Pier Drilling

Inspection to be completed when pier layout is complete and drilling contractor is ready to begin drilling.

A. Requirements for the Builder:

(1) Site specific foundation plan must be on the jobsite.

(2) String lines must be in place or piers located with construction stakes per foundation plan.

B. Required Inspection Procedures:

(1) Review the foundation plan to ensure that it is for the specific site and is signed, sealed and dated by the engineer of record.

(2) After reviewing the foundation plan check:

(a) Proper location of all piers.
(b) A minimum of fifty percent (50%) of the piers must be inspected to ensure proper depth, size and reinforcing steel. At least two (2) piers must be inspected at opposite corners of the foundation. Inspection should include a log of depth into required bedrock and any additional embodiment required by the structural engineer. If refusal occurs at less than the required depth, the geotechnical engineer and structural engineer must be advised for additional recommendations and approval.
(c) The upper three feet (3') of the pier must be within tolerance. A maximum tolerance due to drill wobble is plus two inches (2") in the pier diameter. Mushroomed pier tops must be trimmed to the specified pier diameter plus tolerance or Sono-tubes must be used to form the top of the pier to ensure the proper diameter. The tolerance is plus or minus one inch (1").
(d) Groundwater conditions. A maximum of two inches (2") of water is permitted. If excessive water accumulates in the pier, a concrete tremie must be used to displace the infiltrating water and temporary steel casing must be used to minimize water infiltration. Pier must be clean and free of all loose material.
(e) Proper pier vertical alignment. Tolerance is two percent (2%) of length of pier (for example, five inches (5") for a twenty foot (20') long pier.)
(f) Reinforcing steel must be the specified size and be spaced in the pier hole to assure proper concrete cover and bonding area. Lateral ties consisting of #3 ties spaced a maximum of twenty four inches (24") on center, or as specified by the structural engineer. Caging is required for more than two bars. Caging must be at three feet (3') from the bottom and top of the pier with a maximum distance of three feet (3') between cages.

5.4.5 Nonstandard Foundation Systems - Basement Foundation Wall Construction

Inspection to be completed when formwork, void boxes and reinforcing steel is in place and ready for placement of concrete.

A. Requirements for the Builder:
(1) Site specific foundation plan must be on the jobsite.

B. Required Inspection Procedures:
(1) Review the foundation plan to ensure that it is for the specific site and is signed, sealed and dated by the engineer of record.
(2) After reviewing the foundation plan check:

(a) Footing system -- grade beam or wall centerline and centerline of footing must be aligned properly, tolerance is ±1/2 inch unless plans specify other acceptable tolerance.
(b) Drilled piers -- wall centerline and centerline of piers aligned properly. Alignment tolerance is as follows. Maximum off-center tolerance allowed is fifty percent (50%) of pier diameter. No two adjacent piers are permitted to be out of alignment. Limit ten percent (10%) of piers allowed to be at maximum tolerance.
(c) Basement wall dimensions, correct height, thickness and lengths.
(d) Proper reinforcing steel for size, grade, cleanliness and proper placement. All reinforcing steel, including additional bars at openings and at step-down walls, must be in place. Reinforcing steel at top of foundation walls must be within three inches (3") of the top of the wall unless specifically detailed by the engineer and shown on the plans.

5.4.6 Final Grade – All Foundation Systems

Inspection to be completed after final grading is completed.

Foundation Perimeter Grading:

A) All homes shall have positive drainage away from the foundation. A minimum uniform slope away from the foundation of five percent (5%) is recommended, (but may be reduced if allowed by the local building code and those criteria are met). Yards shall have grades and swales that provide for proper drainage away from the home.

B) Where expansive clay soils are on site: The minimum slope away from the foundation shall be five percent (5%) for the first ten feet (10'), or as required by the geotechnical engineer and reported in the Geotechnical Report. Low spots and/or obstructions are not permitted. All concrete sidewalks, driveways, patio slabs, and porch slabs shall be sloped away from foundation and constructed so that water is not prevented from flowing to suitable drainage. Where a five percent (5%) slope is not possible, such as around patios, at rear high point on ("A") lots graded to drain from back to front, or at side high points on ("B") lots graded to drain to the front and back, slope may be reduced in these localized areas as necessitated by site or design constraints. Runoff water from roofs and slope drainage should be collected and directed away from the home by swales. The minimum slope to the high end of the swale should be one percent (1%).

C) Lot or subdivision grading and drainage: Drainage of the lot and surrounding property shall be sufficient to prevent ponding of excessive runoff adjacent to the foundation. Subdivision grading will be in accordance with approved plan.

D) Rain gutters, downspouts and splash blocks: On all homes located in expansive soil areas rain gutters and downspouts shall be installed to allow runoff to drain beyond the limits of the foundation (minimum of three feet (3')). Splash blocks or downspout extensions are required at all downspout turn-outs or elbows next to the foundation and at exterior water faucets in order to discharge water three feet (3') beyond the foundation. On homes located in non-expansive soil areas rain gutters and downspouts may be omitted if sufficient roof overhang of two feet (2') or more is provided, or where rainfall is minimal and the typical residential construction in the area does not require downspouts.

E) Where expansive clay soils are on-site, downspouts or extensions shall not discharge water into un-drained landscaped flower or shrubbery immediately adjacent to foundations.

F) If the necessary drainage requirements can not be met due to adverse topography, an alternative drainage plan must be designed by and inspected by a 2-10 HBW geotechnical engineer.

5.4.7 Final Workmanship

Call for inspection at the completion of construction of a residence if 2-10 HBW has notified you of this inspection requirement. In general, homes constructed where building departments are not performing a final inspection, or where the Application for Home Enrollment is more than six (6) months after the date of closing, will require a final workmanship inspection.

The purpose of the Final Workmanship inspection is to allow 2-10 HBW to determine that builders provide adequate completion of homes and that all work adheres to the performance guidelines contained within the 2-10 HBW Warranty, the Home Buyers Warranty Program Limited Workmanship/Systems and Structural Coverage Builder Proposal and Agreement, and all local industry standards.

SECTION 6

QUALIFICATION OF ENGINEERS AND FEE INSPECTORS IN TEXAS

6.1 INTRODUCTION

2-10 HBW Risk Management and NHIC require builders to use individual engineers or engineering firms who are on our approved engineers list to prepare all required geotechnical investigations and foundation designs. Inspections of engineered foundation systems must be performed by either a 2-10 HBW approved engineer or fee inspector.

6.2 REQUIREMENTS FOR ENGINEERS

Individual engineers may qualify to be placed on our approved list either as a structural engineer or geotechnical engineer or in both categories. To qualify in either or both categories an engineer must complete a 2-10 HBW Engineering Questionnaire (a copy is shown at the end of this section), submit a copy of his/her current resume, and be approved by 2-10 HBW.

Minimum qualifications are:

1. Registered professional engineer in Texas with a degree in Civil, Structural, or Geotechnical Engineering.
2. Five (5) years of qualifying experience in the application of their engineering specialty to the unique geological and soil conditions found in Texas.
3. Agree to follow the guidelines contained in the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* and the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1,* the applicable standards of the American Concrete Institute (ACI), and the standards contained in the *International Residential Code for One and Two-Family Dwellings* published by the International Code Council.
4. Agree to follow all 2-10 HBW Warranty Program guidelines contained in this Manual in performing engineering work on homes to be enrolled in the 2-10 HBW Warranty Program.

Engineering firms may qualify to be placed on our approved list either in structural engineering or geotechnical engineering or in both categories. To qualify in either or

both categories an engineering firm must complete a 2-10 HBW Engineering Questionnaire (a copy is shown at the end of this section) and be approved by 2-10 HBW. Minimum qualifications for an engineering firm are that all project engineers or engineers-in-charge assigned to perform work for 2-10 HBW member builder must:

1. Be a registered professional engineer in Texas with a degree in Civil, Structural or Geotechnical Engineering.
2. Have five (5) years of qualifying experience in the application of their engineering specialty to the unique geological and soil conditions found in Texas.
3. Agree to follow the guidelines contained in the Post-Tensioning Institute's (PTI) publication *Design of Post-Tensioned Slabs-On-Ground, 3rd Edition,* and the Texas Section of the American Society of Civil Engineers publication *Recommended Practice for the Design of Residential Foundations, Version 1,* the applicable standards of the American Concrete Institute (ACI), and the standards contained in the *International Residential Code for One and Two-Family Dwellings* published by the International Code Council.
4. Agree to follow all 2-10 HBW guidelines contained in this Manual in performing engineering work on homes to be enrolled in any 2-10 HBW Warranty Program.

6.3 REQUIREMENTS FOR CONTRACT FEE INSPECTORS

In the 2-10 HBW Warranty Program, contract fee inspectors are used to supplement the inspections conducted by Jurisdictional Building Departments, engineers and staff inspectors. The Inspection Guidelines in Section 5 of this Manual identifies for builders those inspections and conditions requiring contract fee inspections. Builders are responsible for payment of a mutually agreed to inspection fee directly to the contract fee inspector for inspections.

To qualify as a contract fee inspector in the 2-10 HBW Warranty Program, an inspector must complete a 2-10 HBW Contract Fee Inspector Approval form and Referral Agreement (copies of which are shown at the end of this section) and be approved by 2-10 HBW.

Minimum qualifications are:

1. Educational and experience background in the construction industry which is compatible with inspection responsibilities.
2. Five (5) years of qualifying experience, with FHA, VA, or an approved building department, in the inspection of home construction in Texas or be certified by one or more of the Model Building Codes as a Building Inspector.
3. Agree to follow all 2-10 HBW Warranty Program guidelines contained in this Manual in performing inspections on homes proposed to be enrolled in any 2-10 HBW Warranty Program.

6.4 LIST OF APPROVED ENGINEERS AND FEE INSPECTORS

2-10 HBW reserves the right to make additions to or, deletions from its list of approved engineers or fee inspectors at the sole discretion of 2-10 HBW or NHIC.

6.5 JURISDICTIONAL BUILDING DEPARTMENTS

2-10 HBW relies upon Jurisdictional Building Departments in Texas to perform many of the inspections involved in home construction. Builders should refer to Section 5, Inspection Guidelines, for those inspections that may be performed by Jurisdictional Building Department inspectors and accepted by 2-10 HBW.

Jurisdictional Building Departments are evaluated by 2-10 HBW through responses to questionnaires and visits to regional offices. In a few cases, 2-10 HBW may require builders to use contract fee inspectors in a region where, in 2-10 HBW's opinion, the Jurisdictional Building Department is not enforcing the minimum regulations contained in the *International Residential Code for One and Two-Family Dwellings* published by the International Code Council, or any other locally adopted Model or other approved Building Codes to the standards required in the 2-10 HBW Warranty Program. Builders are responsible for payment of a mutually agreed to inspection fee directly to the contract fee inspector for those inspections.

6.6 APPROVAL FORMS

The application and approval forms for engineers and contract fee inspectors are shown on the pages that follow.

2-10 HBW PROGRAM

TEXAS ENGINEERS' QUESTIONNAIRE

Home Buyers Warranty Corporation ("2-10 HBW") and National Home Insurance Company (A Risk Retention Group) ("NHIC") maintains a list of approved engineers and engineering firms who builders use to provide engineering services on the construction of homes to be entered into the 2-10 HBW Warranty Program. Please complete this questionnaire and **provide a copy of your current resume and/or your company brochure** if you wish to be considered for a position on the 2-10 HBW List of Approved Engineers.

1) Are you a registered professional engineer in Texas? _____

2) The Texas Board of Registered Professional Engineers places a new registrant in an engineering discipline. In which discipline were you placed upon registration? _____

3) Are you currently in good standing? _____

4) Have you ever had your license suspended or revoked in any state? _____

5) In what engineering discipline was your engineering degree(s)? _____

6) In which areas of the United States are you currently practicing engineering? _____

7) In what fields will you practice when providing services to 2-10 HBW member builders:
   - A) Geotechnical Engineering ..... Yes___No___
   - B) Structural Engineering ..... Yes___No___
   - C) Engineered Foundation Inspections ..... Yes___No___
   - D) Post-Tensioned Foundation Inspections ..... Yes___No___
   - E) Post-Tensioned Tendon Stressing Certification ..... Yes___No___

8) List the number of years experience in which you have applied your engineering specialty to the following:
   - A) Geotechnical Engineering ..... _____ years
   - B) Structural Engineering ..... _____ years
   - C) Engineered Foundation Inspections ..... _____ years
   - D) Post-Tensioned Slab Inspections ..... _____ years
   - E) Post-Tensioned Tendon Stressing Certification ..... _____ years

9) Are your field investigations and geotechnical reports conducted in accordance with Section 3 of this Texas Risk Management Manual?

YES NO

If no, please indicate where your investigations differ and why?

_____

_____

_____

_____

Will you in the future, when performing geotechnical investigations for 2-10 HBW member builders, conduct those investigations in accordance with Section 3 of this Texas Risk Management Manual?

YES NO

10) Are your engineered foundation systems designed in accordance with Section 4 of this Texas Risk Management Manual?

YES NO

If no, please indicate where your designs differ and why?

_____

_____

_____

_____

Will you in the future, when performing engineered foundation systems designs for 2-10 HBW member builders, conduct those investigations in accordance with Section 4 of this Texas Risk Management Manual?

YES NO

11) I/We have read the Texas Risk Management Manual for 2-10 HBW Builders, Engineers and Fee Inspectors and agree to comply with all requirements and guidelines in the professional services I/We perform in subsurface soils investigations, foundation designs and inspections of engineered foundation systems for builders who plan to issue 2-10 HBW warranties to their clients.

12) I/We understand and acknowledge that the engineering services, reports and inspections I/We provide to 2-10 HBW member builders will be used and relied upon by **HOME BUYERS WARRANTY CORPORATION** and **NATIONAL HOME INSURANCE COMPANY** to make engineering and financial decisions.

13) Termination of Agreement

A) Termination by the Engineer
You may terminate this agreement by giving written notice as follows:
National Home Insurance Company
(A Risk Retention Group)
C/o Home Buyers Warranty Corporation
1417 West Arkansas Lane
Arlington, TX 76013-6270
Attention: Texas Risk Manager

B) Termination by National Home Insurance Company (A Risk Retention Group)
National Home Insurance Company (A Risk Retention Group) may terminate this agreement by giving written notice to the engineer at the address below.

_____
(Lettered Name)

_____
(Date)

_____

_____

_____
(Address)

_____
(Engineers Seal and Signature)

_____
(Phone Number)

_____
(Fax Number)

TEXAS ENGINEERS'
QUESTIONNAIRE

If you are submitting this Questionnaire for your engineering Firm, please complete the following information and **provide a copy of your company brochure or qualification form.**

Engineering Firm Name: _____

Principal Contact Engineer: _____

Mailing Address: _____

_____

_____

Names of project engineers and engineers-in-charge who sign and seal work for builders who provide 2-10 HBW warranties on homes.

_____

_____

_____

_____

_____

_____

For NHIC use only

NHIC Approval Date _____

NHIC Disapproval Date_____

Engineering Classification_____

_____

Texas Risk Manager

Send Completed Questionnaire To:

Texas Risk Manager
Home Buyers Warranty Corporation
1417 West Arkansas Lane
Arlington, TX 76013-6271

2-10 HBW PROGRAM

TEXAS CONTRACT FEE INSPECTOR
APPROVAL FORM
(Please print or type all information)

NAME AND ADDRESS

Inspector's Full Name: _____

Date of Birth: _____ Social Security Number: _____

Address
Street: _____

City: _____ State: _____ Zip: _____

Home Phone: _____ Business Phone: _____

EDUCATION (Check Appropriate Box)

High School ☐ Some College ☐ Degree ☐ Other ☐

Technical Training: _____
_____

Are you certified by one of the Model Building Codes as a Building Inspector:

☐ Yes ☐ No If yes, Which Building Code?
_____

INSPECTION EXPERIENCE

I have performed inspection(s) for: FHA _____ VA _____
Municipal or County Building Dept. _____

Other (Specify)
_____
_____
_____
_____

Type of inspections performed and number of years experience (Check Box)

Inspection Type	Years
☐ Structural	_____
☐ Electrical	_____
☐ Plumbing	_____
☐ Mechanical	_____
☐ Other	_____ (Specify Below)

_____

_____

REFERENCES

List only individuals familiar with your inspection skills and work experience. (Not Relatives)

Name: _____ Occupation: _____

Address: _____ Phone: _____

How long have you known this person? _____

Name: _____ Occupation: _____

Address: _____ Phone: _____

How long have you known this person? _____

Name: _____ Occupation: _____

Address: _____ Phone: _____

How long have you known this person? _____

Name: _____ Occupation: _____

Address: _____ Phone: _____

How long have you known this person? _____

Name: _____ Occupation: _____

Address: _____ Phone: _____

How long have you known this person? _____

Name: _____ Occupation: _____

Address: _____ Phone: _____

How long have you known this person? _____

CONFLICT STATEMENT (Check Appropriate Box)

Are you currently active as an arbitrator, claim adjuster or repair contractor?

☐ YES ☐ NO

If Yes, please specify:

_____

_____

CERTIFICATION

I hereby certify that the foregoing statements are true and correct to the best of my knowledge and hereby grant Home Buyers Warranty Corporation and National Home Insurance Company (A Risk Retention Group) permission to verify such statements. I understand that any false statement on this form may be considered as sufficient cause for rejection of this form or for removal from the approval list if such false statement is discovered subsequent to my approval.

Arbitrators, claim adjusters or repair contractors are not allowed to participate as 2-10 HBW approved fee inspectors. I understand that I may not participate as an arbitrator, claim adjuster or repair contractor and remain as an approved inspector in the 2-10 HBW Warranty Program. If I chose to participate in one of these activities, I will notify Home Buyers Warranty Corporation and National Home Insurance Company (A Risk Retention Group) and be subject to removal from the 2-10 HBW approved Inspector Referral List.

Date _____

_____

Applicant Signature

For NHIC use only:

NHIC Approval Date _____

NHIC Disapproval Date_____

Engineering Classification_____

_____

Texas Risk Manager

Send Completed Questionnaire To:

District Risk Manager
Home Buyers Warranty Corporation
1417 West Arkansas Lane
Arlington, TX 76013-6271

INSPECTION REFERRAL AGREEMENT
(INDEPENDENT CONTRACTORS)

THIS INSPECTION REFERRAL AGREEMENT (INDEPENDENT CONTRCATORS) ("AGREEMENT") is entered into as of _____, 20___, between National Home Insurance Company (A Risk Retention Group) (sometimes referred to as "NHIC") and _____ (sometimes referred to as "you" or Consultant).

WHEREAS, Consultant desires to participate in the 2-10 HBW Warranty Program as an inspector for the construction of homes constructed by 2-10 HBW Member Builders; and

WHEREAS, Consultant's participation as an inspector is subject to the terms and conditions of this AGREEMENT;

NOW THEREFORE, for valuable consideration, the receipt and sufficiency which are acknowledged, the parties agree as follows. This AGREEMENT sets forth the conditions under which NHIC may refer construction inspections to you and under which you may accept referrals for construction inspection services, as an independent contractor, on homes being constructed by Member Builders who wish to enroll their homes in the 2-10 HBW Warranty Program.

NHIC and you agree to the following mutual promises:

ARTICLE 1 - SERVICES

1.1 Referrals

During the term of this AGREEMENT, it is your choice to perform or not to perform construction inspection services on homes being constructed by Member Builders who wish to enroll their homes in the 2-10 HBW Warranty Program. You shall have no obligation to accept any construction inspection with Member Builder referred to you by NHIC. In addition, you shall be free at all times to perform additional construction inspection services through or for any other individual, company, or agency. However, you agree that if you accept an inspection you will be bound by the terms of this AGREEMENT.

NHIC shall not be obligated to refer any inspections to you in any given number or by any priority. During the term of this AGREEMENT, NHIC may maintain your name on its list of approved inspectors to be considered for referral by NHIC, or its affiliates for construction inspections.

1.2 Training

By entering into this AGREEMENT, you represent to NHIC that you require no training and that you are experienced in performing construction inspections of the type NHIC relies upon to accept enrollments of homes. You also agree to provide, upon request, evidence satisfactory to NHIC that your background, experience, training, and education qualify you to perform as a construction inspector for NHIC.

1.3 Quality and Control of Work

For each construction inspection referred to you by NHIC, and accepted by you, you shall perform the construction inspection according to the highest professional standards. You shall use the highest professional standards in the application of NHIC's risk management standards (defined in the Texas Risk management Manual for 2-10 HBW Builders, Engineers and Fee Inspectors) for the home being inspected and in the interpretation of the architectural and engineering plans prepared by or on behalf of the Member Builder. For each inspection you shall prepare a report containing information customarily included in home warranty inspection reports, which shall be in a form acceptable to NHIC. NHIC shall have no right to direct or control your work as to the manner, method or means by which you perform your inspections or as to the specific format of your report. You agree, however, to exercise your best efforts to adhere to any construction schedule created by the Member Builder of each home you inspect in order to avoid any unreasonable delay in the Member Builder's construction schedule.

At your own expense and obligation, you shall have the complete responsibility, power, and authority to employ, direct, and supervise the activities of any assistants, technicians, or other persons, as your employees. However, without the prior consent of NHIC, you shall not delegate your duty to perform any construction inspections which you have accepted under this AGREEMENT.

1.4 Car, Office and Equipment

You shall own and maintain, at your own cost and expense, all offices, automobiles, equipment, tools, and supplies required to enable you to perform your construction inspection services under this AGREEMENT. You shall have no right to use any of NHIC's equipment, office space, or personnel without NHIC's consent.

1.5 Insurance

You agree that NHIC is not responsible for obtaining or maintaining any worker's compensation, unemployment, automobile, professional liability or any other insurance on your behalf. You shall maintain any and all insurance required by law to be carried by an employer on behalf of its employees at all times during which this AGREEMENT is in effect. You are not entitled to unemployment, or worker's compensation benefits under the terms of this AGREEMENT. Unemployment or Worker's Compensation coverage for you and your employees must be provided by you. You have signed Attachment A to this AGREEMENT.

ARTICLE 2 - FEES AND EXPENSES

2.1 Inspection Fees

The Member Builder or NHIC shall pay to you a fee which is agreed to in advance by both you and the Member Builder or you and NHIC for each construction inspection you perform. Neither the Member Builder nor NHIC will withhold Federal, State, or local taxes for any payment made to you. You are obligated to pay all Federal, State, and local taxes on any moneys paid to you under this AGREEMENT.

2.2 Billing

You and the Member Builder or you and NHIC shall mutually agree in advance on the payment schedule for all construction inspections performed by you.

2.3 Expenses

You shall pay all costs and expenses you incur in performing construction inspection services under this AGREEMENT, including, but not limited to all costs and expenses associated with your ownership of automobiles, tools, equipment, offices and insurance. You and the Member Builder shall determine in advance whether any or all of your expenses are billed separate from or included in your inspection fee.

ARTICLE 3 - TERM OF AGREEMENT

3.1 Term

This AGREEMENT shall be effective immediately upon signing by you and NHIC and shall terminate without action by you or NHIC on December 31, 20___, unless this AGREEMENT is terminated before that date as provided in Article 4.

ARTICLE 4 - TERMINATION OF AGREEMENT

4.1 Termination by You

You may terminate this AGREEMENT by giving written notice to NHIC in accordance with Article 6 of this AGREEMENT. Upon receipt of your written notice, NHIC will remove your name from its list of approved inspectors.

4.2 Termination by NHIC

NHIC may terminate this AGREEMENT by giving written notice to you in accordance with Article 6 of this AGREEMENT. Upon providing written notice to you, NHIC will remove your name from its list of approved inspectors.

ARTICLE 5 - PROTECTION OF 2-10 HBW

5.1 Protection Against Loss

You agree to indemnify and hold harmless NHIC, Home Buyers Warranty Corporation and its affiliates against loss, damage, liability, claims, expenses and reasonable attorney's fees due to your negligence or willful misconduct in performing construction inspections referred to you and accepted by you under this AGREEMENT.

5.2 Representation

You shall not represent yourself to any Member Builder or other third party as an employee of or otherwise under the control of NHIC. You shall represent yourself only as an independent, qualified, construction inspector who 2-10 HBW refers to Member Builders who wish to enroll their homes in 2-10 HBW Warranty Programs.

ARTICLE 6 - ADDITIONAL PROVISIONS

6.1 Conflict of Interest

In order to avoid conflicts of interest, NHIC does not allow arbitrators, claim adjusters, and repair contractors to also be approved construction inspectors for NHIC. During the term of this AGREEMENT if you chose to perform services as an arbitrator, claim adjuster, or repair contractor, you shall notify NHIC and be subject to removal from NHIC's approved inspector referral list.

6.2 Sale of Rights

This is an AGREEMENT between you, as an independent, qualified, construction inspector, and NHIC, therefore you shall not sell, transfer, assign, or pledge your rights, interest, or obligations under this AGREEMENT to any other person or company. NHIC may assign this AGREEMENT to an affiliate or third party administrator of the 2-10 HBW Warranty Program.

6.3 Binding Agreement

After you and NHIC have signed this AGREEMENT, this AGREEMENT is both to your advantage and binding upon you. Likewise, this AGREEMENT is both to NHIC's advantage and binding upon it.

6.4 Complete Agreement

This AGREEMENT and Attachment A contain the entire contractual understanding between you and NHIC with respect to construction inspections performed by you on a referral basis by NHIC.

6.5 Choice of Law

If a dispute between you and NHIC should require settlement in a court of law, the laws of Colorado will govern the dispute. The parties agree that all disputes regarding this AGREEMENT are subject to arbitration in accordance with the rules and procedures of Construction Arbitration Services.

6.6 Waiver

If you violate any provision of this AGREEMENT and NHIC decides to waive this violation on a one-time basis, this waiver does not extend to any other violation of the provisions of this AGREEMENT.

6.7 Independent Provisions

If any provision of this AGREEMENT is not valid or cannot be enforced as written, that provision shall be enforced to the extent legally permissible and all other provisions shall remain valid and enforceable.

6.8 Written Notice

Any notice which you send to NHIC or NHIC sends to you shall be sent by certified mail with return receipt to the address as follows:

If to You: _____

_____

If to NHIC: National Home Insurance Company
(A Risk Retention Group)
2675 S Abilene St
Aurora, CO 80014

6.9 Independent Contractor

Nothing in the provisions of this AGREEMENT shall be interpreted as creating a partnership, joint venture, or employment relationship between you and NHIC. You are an independent contractor performing construction inspection services for Member Builders on a referral basis by NHIC.

BY SIGNING this AGREEMENT below, the provisions of this AGREEMENT are effective on the date shown at the beginning of this AGREEMENT.

National Home Insurance Company
(A Risk Retention Group):

By:_____

Title:_____

BY SIGNING this AGREEMENT below, you approve and accept this AGREEMENT as of _____, 20___.

Consultant:

Signature:_____

Printed
Name: _____

Attachment A

TEXAS WORKERS' COMPENSATION COMMISSION
7551 Metro Center Drive, Suite 100
Austin, Texas 78744

If you are not certain whether all parties meet the requirements for entering into this agreement, you may wish to consult an attorney.

Texas Workers' Compensation Act, Texas Labor Code, Section 406.121(2) defines "independent contractor" as follows: (1) "Independent contractor" means a person who contracts to perform work or provide a service for the benefit of another and who ordinarily: (A) acts as the employer of any employee of the contractor by paying wages, directing activities, and performing other similar functions characteristic of an employer-employee relationship; (B) is free to determine the manner in which the work or service is performed, including the hours of labor of or method of payment to any employee; (C) is required to furnish or have his employees, if any, furnish necessary tools, supplies, or materials to perform the work or service; and (D) possesses the skills required for the specific work or service.

BLANKET AGREEMENT BETWEEN GENERAL CONTRACTOR AND SUBCONTRACTOR
TO ESTABLISH INDEPENDENT RELATIONSHIP

Notice of Agreement

The undersigned Contractor and the undersigned Subcontractor hereby declare that:

(A) the Subcontractor meets the qualifications of an Independent Contractor under Texas Workers' Compensation Act, Texas Labor Code, Section 406.121;
(B) the Subcontractor is operating as an independent contractor as that term is defined under Section 406.121 of the Act;
(C) the Subcontractor assumes the responsibilities of an employer for the performance of work; and
(D) the Subcontractor and the Subcontractor's employees are not employees of the Contractor for purposes of the Act.

CONTRACTOR:
National Home Insurance Company
(A Risk Retention Group)
Signature: _____
Name: _____

SUBCONTRACTOR:
_____
Signature: _____
Name: _____

Estimated number of employees affected: _____

Contractor's Affirmation

If the Contractor's workers' compensation carrier changes during the effective period of coverage, it is advisable for the Contractor to file this form with the new insurance carrier.

_____ Federal Tax I. D. Number

_____ _____ 2675 S. Abilene St.
Signature of Contractor Date Address (Street)

National Home Insurance Company Aurora, CO 80014
Printed Name of Contractor Address (City, State, Zip)

Subcontractor's Affirmation

_____ Federal Tax I. D. Number

_____ _____ _____
Signature of Contractor Date Address (Street)

_____ _____
Printed Name of Subcontractor Address (City, State, Zip)

Three copies of this form must be completed: This agreement must be filed by the Contractor with the workers' compensation insurance carrier of the Contractor within 10 days of the date of execution. The original must be filed with the insurance carrier by PERSONAL DELIVERY OR REGISTERED OR CERTIFIED MAIL. Both the Contractor and the Subcontractor must also retain a copy of the agreement.

Commission Date Stamp Here