TEXAS RESIDENTIAL CONSTRUCTION COMMISSION (TRCC)
PERFORMANCE STANDARDS FOR FOUNDATIONS
AND MAJOR STRUCTURAL COMPONENTS

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CHAPTER 3.2
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Performance Standards for Foundations and Major Structural Components

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NCEES Record No. 11703
Licensed P.E. in 10 states, including Texas
Education - B.S. in Engineering (Civil), Duke University, 1976
Engineering Experience - 27 Years
• Foundation Underpinning - 23 Years
• Heavy and Highway - 4 Years
Construction Experience - 29 Years
• Small Diameter Piling - 23 Years
• Heavy and Highway Construction - 6 Years
Professional Memberships/Affiliates
• American Society of Civil Engineers
• Chairman: Subcommittee to Develop “Guidelines for the Evaluation and Repair of Residential Foundations”
• Foundation Engineers Associations (2000 & 2001 President)
• National Society of Professional Engineers
• Texas Society of Professional Engineers
• National Federation of Independent Business (Guardian Member)
• Deep Foundations Institute

Subchapter A. General Provisions

Issues related to Foundations:
• Definition of Original Construction Elevations (§304.1(c)(13))
  • Elevations taken prior to completion maintained in builder’s file
  • Includes porches and garages that are part of foundation
  • Must take at least one elevation per 100 sq. ft.
  • If not taken, presumed to be level +/- ¾”.
• Repairs per 3rd party inspector’s recommendations and consistent with the Code or performance standard (§304.2(a)(2))
Subchapter A. General Provisions

Issues related to foundations (cont’d):

• Exceptions and exclusions (§304.2(b)(1))
  ▶ Alterations to the grade of the soil, unless directed by builder (D)
  ▶ Extreme weather conditions (F)
  ▶ Change in underground water table (I)
  ▶ Erosion or accretion of soils (J)
  ▶ Excessive loads (O)
  ▶ No actual physical damage (§304.2(b)(2))

Subchapter A. General Provisions

• Exceptions and exclusions (cont’d)
  ▶ Failure to comply with homeowner’s responsibilities (§304.2.(c))
    ▶ General maintenance, including maintaining drainage (1)
    ▶ Landscaping planting (3)
    ▶ Preventing further damage (6)

Subchapter A. General Provisions

Issues Related to Foundations (cont’d)

• Warranty of Habitability (§304.3(f)(2))
  ▶ Complies with performance standards (A)
  ▶ Safe, sanitary & fit to inhabit (B)
Subchapter D. Performance Standards for Foundations and Major Structural Components (§304.100)

Slabs (a)
• Evaluate using “Guidelines for the Evaluation and Repair of Residential Foundations (ASCE Guidelines) (1) with the following criteria:
  ♦ Overall deflection less than L/360 with not more than one associated symptoms of distress (A)
  ♦ Tilt less than 1% resulting in observable physical damage (B).
• Remedial measures to be based on Section of the ASCE Guidelines (2).

Other Structural Components (b)
• Floor over pier and beam (1)
  ♦ Overall deflection must not exceed L/360 and cause actual physical damage (A)
  ♦ Remedial measures based on Section 7 of the ASCE Guidelines
• Structural Components (2)
  ♦ Shall not crack, bow, become distorted or deteriorate, such that it compromises structural integrity or structural system performance of the home and results in actual physical damage (A)
  ♦ Remediation includes repair, replacement or reinforcement to restore structural integrity or performance

Other Structural Components (b) (continued)
• Deflected Structural Components (3)
  ♦ Shall not deflect more than ratios allowed by Code
  ♦ Remediation includes repair, replacement or reinforcement to restore structural integrity or performance
• Damaged Structural Components (4)
  ♦ Shall not compromise structural integrity or performance
  ♦ Remediation includes repair, replacement or reinforcement to restore structural integrity or performance
Other Structural Components (b) (continued)

- Separated Structural Components (5)
  - Shall not separate more than ¾” or such that it compromises structural integrity or performance
  - Remediation includes repair, reinforcement or replacement to re-establish the connection and to restore structural integrity or performance

- Non-performing Structural Components (6)
  - Components shall perform function per Code
  - If not, builder shall take such action to make the component perform per Code

What are the ASCE Guidelines?

- Developed by a sub-committee of the Texas Section of the American Society of Civil Engineers
- 2½ year all volunteer effort (monthly all day meetings)
- 17 Professional Engineers from across Texas on the sub-committee
- Approved by an Oversight Committee and adopted by the Texas Section, ASCE
- Generally non-mandatory language (“should” and “may” vs. “shall”).
- Available for downloading at: www.texasce.org

What are the Issues?

- Is the “Major Structural Defect” definition gone?

  Not Really
  - “Actual Physical Damage” remains (§304.2(b)(2))
  - “Failure” is replaced with performance standards
  - “Unsafe, unsanitary and otherwise unlivable” remains under the Warranty of Habitability (§304.3(f))

  but . . .
  The Warranty of Habitability applies in addition to the Structural Components Warranty
What are the Issues?

Deflection and Tilt

- How are deflection and tilt measured?
- Will 3rd party inspectors measure them accurately and consistently?
- Will all parties understand these measurements?
- How do deflection and tilt affect the structure?
- How much is too much?

Deflection

Slope and Tilt

- Tilt of 1" is 10'-0"
Deflection and Tilt

Deflection causes cracking.

Deflection and Tilt

Tilt generally does not cause cracking.

What are the Issues?

- How reasonable are the deflection and tilt standards?

  Deflection is reasonable, provided it is measured properly

  - Based analogous IRC deflection limit
  - Causes noticeable cracking in the foundation and finishes
What are the issues?

• How reasonable are the deflection and tilt standards?

One-percent (1%) tilt is also reasonable, but the requirement for actual physical damage is too lenient

◦ Tilt generally doesn’t cause cracking
◦ Safety may be an issue in some cases

One Percent Tilt (to scale)

Deflection and Tilt

Sometimes tilt becomes a safety issue
What are the issues?

Will 3rd-Party Inspectors measure tilt and deflection accurately?
- Inspector training to date has focused on the process, not technical matters
- If original construction elevations are not available, tilt and deflection calculations become much more difficult and less definitive due to the assumption that the slab was constructed “level” +/- ¾”

What are the issues?

Timing of remedial measures
- The ASCE Guidelines suggest that non-structural measures are often appropriate as a first step, with a monitoring period
- Generally a good idea, but may not be necessary in some cases
- Causes delay in final resolution, but should be allowed if recommended by 3rd Party Inspector

Questions?