

LINEBERGER CONSULTING ENGINEERS

Serving Greater Central & South Texas.

210.601.1379 (San Antonio) 512.522.9197 (Austin) LINEBERGER Consulting Engineers

STRUCTURAL ENGINEERING INVESTIGATION REPORT NO. 4EXYRHAWN

PHYSICAL PROPERTY ADDRESS: 6314 Ridge Tree Dr. San Antonio TX 78250

Click [here](#) to discuss/obtain copies of this report.

R E P O R T S U M M A R Y

PROPERTY INFORMATION¹

Report Date: 6.11.2020	Building Type: Single Family Residence	Front/Rear Entry Building Elevations Presumed Facing: North/South	Floor Level(s): one
Investigation Date: 6.11.2020			Investigation Type: ☒ On-Site
ASCE Structural Investigation Level: ☒ A ☐ B ☐ C		Data Collection Method: ☒ Visual ☐ Invasive	
Structural System(s) Investigated:		☒ Slab-on-grade foundation system	

INVESTIGATION FINDINGS

1. Is this Slab-on-grade foundation system structurally sound?	☒ YES	☐ NO
2. Does this Slab-on-grade foundation system require <u>structural repair</u> or <u>structural stabilization</u> ?	☐ YES	☒ NO
3. Next follow-up Structural Engineering Investigation recommended in:	☒ None required	☐ 3 mo. ☐ 6 mo. ☐ 12 mo. ☐ 18 mo. ☐ 24 mo.

INVESTIGATION RECOMMENDATIONS^{2,3,4}

Recommendations:	☒ This Slab-on-grade foundation system <u>is</u> Structurally Sound and <u>does not</u> require structural repairs and/or structural stabilization.
	☐ This Slab-on-grade foundation system <u>is not</u> Structurally Sound and <u>does</u> require Structural repairs and/or structural stabilization.
Engineer in Responsible Charge: Jeff Lineberger, P. E. Lineberger Consulting Engineers, Inc. 19141 Stone Oak Parkway, Suite 104 San Antonio, TX 78258 structural.sciences@gmail.com www.structuralsciences.com Texas Registered Engineering Firm No. F-4694 Texas Engineering Serial Number 65133	6314 Ridge Tree Dr. San Antonio TX 78250  6.11.2020

STRUCTURAL ENGINEERING INVESTIGATION REPORT NO. 4EXYRHAWN

PHYSICAL PROPERTY ADDRESS: 6314 Ridge Tree Dr. San Antonio TX 78250

Click [here](#) to discuss/obtain copies of this report.

ENGINEER'S RECORD

OF

INVESTIGATION

FINDINGS & RECOMMENDATIONS

TABLE OF CONTENTS

SECTION 1.....PURPOSE, FINDINGS & RECOMMENDATIONS

SECTION 2.....TOPOGRAPHIC PROFILE

SECTION 3.....DIAGNOSTIC ANALYSES & TESTING

SECTION 4.....CONFIDENTIALITY & LIMITATIONS

LINEBERGER CONSULTING ENGINEERS

Serving Greater Central & South Texas.

210.601.1379 (San Antonio) 512.522.9197 (Austin)

LINEBERGER
Consulting Engineers

STRUCTURAL ENGINEERING INVESTIGATION REPORT NO. 4EXYRHAWN

Physical Property Address: 6314 Ridge Tree Dr. San Antonio TX 78250

Click [here](#) to discuss/obtain copies of this report.

SECTION 1

PURPOSE, FINDINGS & RECOMMENDATIONS^{5,6}

PURPOSE.

The customer seeks to determine the structural condition of the residence foundation system. Information collected at the referenced property address on 6.11.2020 indicates this Single Family Residence is a one-level wood framed structure built atop a ground supported Slab-on-grade foundation system. Observation orientations presume the residence front entry exterior perimeter wall faces North and its rear exterior perimeter wall faces South. The residence foundation system is positioned on a shallow sloping lot within a medium density residential property area. This foundation system has a rectilinear footprint geometry.

Local area native bearing soils can expand and shrink volumetrically with changes in their moisture contents. On-site investigation conditions on 6.11.2020 were generally partly cloudy. Foundation perimeter surface soil conditions were generally dry-to-moist. Customer provided engineering opinions/investigations pertaining to this property were unavailable for review by the engineer. The engineer reviewed customer supplied information. The residence was unoccupied and the customer/representative was present on-site during the investigation. The customer or customer's representative did review the interior and exterior residence foundation condition observations with the engineer on-site. This investigation concluded when the site data was collected and recorded and the customer had no further questions. Investigation findings and recommendations are summarized as follows:

FINDINGS.

1. Structural examination & analyses indicate:
 - [a.] this foundation system **is structurally sound**.
 - [b.] this foundation system is **reasonably serviceable** consistent with its age, geometry, and local geographical conditions. 'Reasonably Serviceable' (serviceability), as used herein, shall mean the extent to which the structural system achieves its intended purpose. A reasonably serviceable residential foundation system shall:
 - i. resist abnormal or excessive displacement which may impair the reasonable use of its connecting floor, wall, and roof frame structural systems.
 - ii. resist abnormal or excessive displacement which may impair the reasonable use of its supported floor, wall, and ceiling/roof brittle covering materials.
 - iii. have floor surface conditions which generally promote living space habitability and/or reasonably expected use activities consistent with its residential classification or occupancy.
 - [c.] When compared to similar foundation systems located in similar geographic conditions, this reasonably serviceable foundation system is underperforming when it does not fully achieve its intended purpose. The intended purpose of a residential foundation system is indicated in item [b.] above.
 - [d.] this single-level foundation has a maximum floor surface profile variance of: ~2.7 inch. This single-level foundation floor surface profile indicates overall tilt less than the maximum allowable of 1%.
 - [e.] this single-level foundation system has **no** material defects or distress patterns which **are** consistent with foundation structural strength failure.
 - [f.] Previous excavations along the foundation perimeter beam do not have adequate soil backfill. Customer is advised to ensure any perimeter beam areas are sufficiently back-filled with compacted fill materials to eliminate voids and spaces that would otherwise allow stormwater to infiltrate under the residence foundation system. Example images: <https://photos.app.goo.gl/M3c2YM5f2jGMwYe7>
 - [g.] this foundation system was reported as having been *fractionally underpinned*. Click [here](#) more information about 'fractional underpinning'.
 - [h.] this shallow bearing ground supported foundation system likely bears atop expansive soils and/or materials which shrink or swell volumetrically upon drying or wetting. **Note: Shallow bearing ground supported foundation systems bearing atop expansive soils may be expected to displace or rotate over time.**
 - [i.] structural foundation repair or stabilization are **not** required.
 - [j.] **Gapping: rear porch-to-foundation** were indicated. These gaps may provide channelized pathways for stormwater to infiltrate beneath the residence foundation. Customer is advised to eliminate these gaps.
 - [k.] **Gapping: interior partition wall-to-floor surface** were indicated. These gaps may indicate an excessive vertical displacement of the foundation, the wall, or both. The customer is advised to eliminate these gaps by re-attaching the wall to its supporting floor surfaces. Sample images: <https://photos.app.goo.gl/BPc69iDFXUKvpAp8>

LINEBERGER CONSULTING ENGINEERS

Serving Greater Central & South Texas.

210.601.1379 (San Antonio) 512.522.9197 (Austin) LINEBERGER Consulting Engineers

STRUCTURAL ENGINEERING INVESTIGATION REPORT NO. 4EXYRHAWN

Physical Property Address: 6314 Ridge Tree Dr. San Antonio TX 78250

Click [here](#) to discuss/obtain copies of this report.

2. Data and engineering analysis indicate the following observed distress types are cosmetic, do not currently indicate defective structural foundation or frame systems, and are not currently consistent with structural system failure:
- [a.] **Garage floor surface cracking/Foundation perimeter beam plaster cracking/Foundation perimeter beam cracking/Rear entry porch floor cracking.** These types/locations of distress do not indicate systemic structural pathologies nor do they currently threaten the single-level foundation system structural integrity. Being the probable result of localized concrete volume shrinkage (aka 'restraint cracking'), non-uniform concrete mixing, improper curing, or inadequate placement techniques, the indicated concrete cracking are unrelated to abnormal foundation displacement. An example epoxy crack repair product is [CRACK-PAC](#). Refer to item #3 below for concrete crack filling and concrete spalling & waterproofing information and techniques.
- [b.] **Masonry veneer/mortar cracking.** Masonry veneer mortar cracking are unrelated to abnormal foundation system displacement. Masonry veneer mortar cracking is the likely the result of:
- Brittle material wall covering response to ambient thermal/moisture changes over time,
 - Thermal and/or moisture driven wall-ceiling wood frame displacement,
 - Expected non-structural periodic bending/rotation/displacement of the building foundation.
- Customer may optionally consider structurally stiffening targeted frame areas where displaced/cracked masonry/mortar veneer wall covering materials are anchored to the wood frame. Doing so may help limit structural framing member dimensional changes caused by their exposure and response to ambient thermal/moisture changes. Alternatively, customer may consider replacing brittle exterior wall coverings with a more flexible material. Typical structural stiffening methods follow:
- Remove/replace/repair supported/connected frame covering materials which are cracking or deemed not cosmetically aesthetic.
 - Expose and evaluate the condition of the supporting framing members and their fasteners.
 - Check to assure the exterior wall coverings are adequately anchored and fastened to the framing members.
 - Remove and replace any damaged framing members (bowed, cracked, twisted, etc.) and/or rusty or loose fasteners.
 - Brace, stiffen, and stabilize supporting framing members/systems as needed.
 - Customer may also consider bracing and stiffening door and window frames which have impaired operability.
- [c.] **Drywall/wall panel cracking.** Drywall cracking is unrelated to abnormal foundation system displacement and is the probable result of:
- Brittle material wall covering response to ambient thermal/moisture changes over time,
 - Thermal and/or moisture driven wall-ceiling wood frame displacement,
 - expected non-structural periodic bending/rotation/displacement of the building foundation.
- Customer may optionally consider structurally stiffening targeted frame areas where their connected interior brittle wall covering materials are cracking. Doing so may help limit structural member dimensional changes caused by their exposure and response to ambient thermal/moisture changes. Alternatively, customer may consider replacing brittle interior wall coverings with a more flexible material. Typical structural stiffening methods follow:
- Remove/replace/repair supported/connected frame covering materials which are cracking or deemed not cosmetically aesthetic.
 - Expose and evaluate the condition of the supporting framing members and their fasteners.
 - Remove and replace any damaged framing members (bowed, cracked, twisted, etc.) and/or rusty or loose fasteners.
 - Brace, stiffen, and stabilize supporting framing members/systems as needed.
 - Customer may also consider bracing and stiffening door and window frames which have impaired operability.
- [d.] **Floor tile/mortar cracking.** When fixed to their adjacent tiles and to their connecting concrete floor surfaces, rigid floor tiles tend to behave as single membrane entities. Bending stress can be transferred from tile-to-tile when the tile floor system is subjected to foundation displacement or other related excessive bending tension stresses. The tile areas least able to resist these excessive bending stresses are the first to fracture and crack. Floor tile cracking is typically caused by two mechanisms:
- Excess bending tension applied to floor tile/mortar when the foundation system floor surface displaces or bends over time, and/or
 - Excess bending tension applied to floor tile/mortar when foundation floor surface non-structural 'shrinkage' cracks develop directly below the tile and then "telegraph" up through the tile/mortar.

RECOMMENDATIONS.

- ☒ Elective maintenance and/or cosmetic restoration (refer to item #3 below).
- ☐ Elective structural repair.
- ☒ Elective crack stabilization (refer to item #3 below).

LINEBERGER CONSULTING ENGINEERS

Serving Greater Central & South Texas.

210.601.1379 (San Antonio) 512.522.9197 (Austin) **LINEBERGER**
Consulting Engineers

STRUCTURAL ENGINEERING INVESTIGATION REPORT NO. 4EXYRHAWN

Physical Property Address: 6314 Ridge Tree Dr. San Antonio TX 78250

Click [here](#) to discuss/obtain copies of this report.

3. Customer, at customer's option, may elect to refer to the information found in the: [FOUNDATION AND FRAMING IMPROVEMENT MANUAL](#)
 - [a.] For Foundation Performance Improvement Guidelines.
 - [b.] For Foundation Drainage Improvement Guidelines.
 - [c.] For exposed and rusting metallic reinforcement waterproofing guidelines.
 - [d.] For any concrete, masonry veneer, plaster/parge coating crack/chipping/spalling repair information. Generally speaking, vertical or horizontal concrete cracks with widths less than 1/32 inch cannot be effectively remediated. Concrete cracks, chips, or spalling with widths exceeding ~1/16 inch are reasonable candidates for epoxy injection repair. Wider cracks with widths in the ~1/8 + inch range may be more effectively repaired by injection or gravity feed techniques. Crack repair procedures may be found here: [FOUNDATION AND FRAMING IMPROVEMENT MANUAL](#).

LINEBERGER CONSULTING ENGINEERS

Serving Greater Central & South Texas.
210.601.1379 (San Antonio) 512.522.9197 (Austin) LINEBERGER Consulting Engineers

STRUCTURAL ENGINEERING INVESTIGATION REPORT NO. 4EXYRHAWN

Physical Property Address: 6314 Ridge Tree Dr. San Antonio TX 78250

Click [here](#) to discuss/obtain copies of this report.

SECTION 2

TOPOGRAPHIC PROFILE^{7,8}

SURVEY SPECIFICATION

Coverage: Floor surfaces directly connected and/or supported by the residence foundation system. **Profile(s) Analyzed:** Foundation floor system surfaces. **Applicable Standard:** IBC/IRC Allowable deflection of structural members. **Data Type/Instrument Type:** Relative elevation level data/Precision Altimeter (*ZipLevel Pro 2000*[®]).

SURVEY ANALYSIS RESULTS

☒ GROUND FLOOR LEVEL PROFILE VARIANCES:

1. ASCE Deflection Case #3: The foundation profile indicates deflection $> L/360$ with sufficient symptoms of deflection present.
2. This single-level foundation floor surface profile indicates overall foundation tilt less than a maximum allowable planar slope of ~1%.
3. This single-level foundation has a maximum floor surface profile variance of ~2.7 inch.

SECTION 3

DIAGNOSTIC ANALYSES & TESTING^{9,10,11,12}

Historical Examination & Analyses (6.11.2020)

☒ Reported	☐ Not Reported	Customer/occupant reports residence structural foundation system(s) previously structurally modified. <i>Note: this foundation system was reported as having been fractionally underpinned. Click here more information about 'fractional underpinning'. Fractional underpinning was discussed with the customer on-site.</i>
☐ Reported	☒ Not Reported	Customer/occupant reports residence structural roof system previously repaired or structurally modified.
☐ Reported	☒ Not Reported	Customer/occupant reports previous or current plumbing system sewer or water leaks beneath the foundation floor surface level positioned directly below, within, or adjacent/near the residence foundation system footprint area. <i>Note: customer is advised to ensure the house plumbing system does not leak.</i>
☐ Reported	☒ Not Reported	Customer/occupant reports localized ground surface flooding or foundation bearing soil/fill moisture saturation during heavy precipitation events occurring near the foundation system perimeter(s).

Civil & Structural Examination & Analyses (6.11.2020)

☒ Do	☐ Do not	Indicate <i>interior or exterior</i> material distress and/or prior repairs. Images: https://photos.app.goo.gl/M4L7ZYyqM6Lgqs8
☐ Do	☒ Do not	Indicate abnormal or excessive ground surface erosion/sedimentation adjacent and along the foundation perimeter and below guttered/un-guttered perimeter roof drip-lines or downspout discharge areas.
☒ Do	☐ Do not	Indicate local area native soils which can expand and shrink volumetrically with changes in their moisture content.
☐ Do	☒ Do not	Indicate abnormally excessive foundation system mid-span displacements, transverse bending, or loss of section.
☒ Do	☐ Do not	Indicate ground surface areas adjacent and/or along the foundation perimeter which provide neutral or negative stormwater drainage away from the residence structure(s), or indicate previous or ongoing foundation system bearing soil moisture content imbalances which may potentially impair the residence foundation <i>structural serviceability, strength, or integrity</i> . <i>Flat ground surface areas principally adjacent to the north and west</i>

LINEBERGER CONSULTING ENGINEERS

Serving Greater Central & South Texas.

210.601.1379 (San Antonio) 512.522.9197 (Austin) LINEBERGER Consulting Engineers

STRUCTURAL ENGINEERING INVESTIGATION REPORT NO. 4EXYRHAWN

Physical Property Address: 6314 Ridge Tree Dr. San Antonio TX 78250

Click [here](#) to discuss/obtain copies of this report.

		<i>foundation perimeters. Customer is advised to slope these ground surfaces downward and away from the foundation wall to ensure stormwater does not infiltrate beneath the residence foundation system.</i>
☐ Do	☒ Do not	Indicate the presence of trees, bushes, or other plant materials which would diminish or threaten the residence foundation <i>structural serviceability, strength, or integrity</i> .
☐ Do	☒ Do not	Indicate the use of any uncontrolled or inadequate foundation system fill or bearing materials which would diminish or threaten the residence foundation <i>structural serviceability, strength, or integrity</i> .
☐ Do	☒ Do not	Indicate imminent or progressive structural collapse conditions or safety concerns.
☒ Do	☐ Do not	Indicate residence material defects or distress (<i>cosmetic, non-structural</i>) consistent with <i>structural frame lateral and/or vertical displacement. Drywall cracking and masonry veneer mortar cracking</i>
☒ Do	☐ Do not	Indicate this foundation system is reasonably serviceable consistent with its age, geometry, and geographical conditions. Note: <i>When compared to similar foundation systems located in similar geographic conditions, this reasonably serviceable foundation system is underperforming when it does not fully achieve its intended purpose.</i>
☐ Do	☒ Do not	Indicate residence material defects or distress patterns consistent with Slab-on-grade foundation system structural strength failure.
☐ Do	☒ Do not	Indicate <u>required</u> structural repairs (modifications) or stabilization procedures directly linked to Slab-on-grade foundation system structural strength failure.

LINEBERGER CONSULTING ENGINEERS

Serving Greater Central & South Texas.

210.601.1379 (San Antonio) 512.522.9197 (Austin) LINEBERGER Consulting Engineers

STRUCTURAL ENGINEERING INVESTIGATION REPORT NO. 4EXYRHAWN

Physical Property Address: 6314 Ridge Tree Dr. San Antonio TX 78250

Click [here](#) to discuss/obtain copies of this report.

SECTION 4

CONFIDENTIALITY & LIMITATIONS

Confidentiality: The Engineer in Responsible Charge is subject to §137.61 of the Texas Engineering Practice Act, "Engineers Shall Maintain Confidentiality of Clients". Paragraph §137.61 requires: (a) The engineer may reveal confidences and private information only with a fully informed client's or employer's consent, or when required by law or court order; or when those confidences, if left undisclosed, would constitute a threat to the health, safety or welfare of the public; (b) The engineer shall not use a confidence or private information regarding a client or employer to the disadvantage of such client or employer or for the advantage of a third party; (c) The engineer shall exercise reasonable care to prevent unauthorized disclosure or use of private information or confidences concerning a client or employer by the engineer's employees and associates.

Limitations: Successful application of the ASCE Guideline requires *experienced engineering judgment*; merely following the guidelines may not achieve a satisfactory result. Unless adherence to this guideline is made mandatory through force of law or by contractual reference, *adherence to it shall be deemed voluntary*.

- i. *The ASCE Guideline does not, of itself, comprise the standard of care which engineers are required to uphold.*
- ii. The term 'client' and 'customer' are synonymous.
- iii. The structural investigation/consultation scope of services were *jointly established and agreed to by both the customer and engineer*.
- iv. If requested by the client, the engineer may only provide evaluation of reports by others, but this should be described as *consultation, not investigation*.
- v. The impact of data and information previously unavailable and acquired after the date of this report may be considered in the engineering analysis and incorporated into its findings.
- vi. The engineer in responsible charge of the investigation personally visited the subject site/building, reviewed any customer provided information, and either discussed or made a good faith effort to discuss investigation findings with the customer on-site or at a mutually agreeable time and place convenient for both the engineer and the customer.
- vii. The client shall make a good faith effort to disclose to the Engineer of Record any known or discovered technical discrepancies contained within this report. The Engineer of Record shall make a good faith effort to resolve such discrepancies, if any, within a reasonable time period.
- viii. Report findings are based upon information and data reasonably available to the engineer on the date the site was visited. This report does not imply, warrant, nor represent, in part or in whole, future prediction(s) of building system structural performance and/or behavior.
- ix. This investigation is not a forensic engineering opinion representing a determination of the origin or underlying cause(s) of the subject building distress, if any. This investigation is not a code evaluation representing a detailed determination of the IBC or IRC building code variances, if any.
- x. Report recommendations are not engineering design instruments and are prohibited for Structural, Civil, or Geotechnical engineering design use.
- xi. This investigation was done according to the ASCE (American Society of Civil Engineers) Guidelines for the Evaluation and Repair of Residential Foundations, v2.

REFERENCE NOTES

1. This structural investigation conforms to the requirements of Texas Section ASCE “*Guidelines for the Evaluation and Repair of Residential Foundations – V2*”
2. Based upon available **testing, analyses, and investigation findings** as of 6.11.2020.
3. ‘**Structural Repair**’ is triggered when **testing, analyses, and investigation findings** indicate a foundation system requires geometry modifications to restore its **Structural Load Bearing Strength**.
4. ‘**Structural Stabilization**’ is triggered **when testing, analyses, and investigation findings** indicate a foundation system requires geometry modifications to: (a.) restore its stiffness; (b.) level its floor surfaces; (c.) limit or prevent its ongoing abnormal displacement and diminished structural performance.
5. Shallow ground bearing structural foundation systems intend to safely separate habitable areas from their exterior environment and limit damage or distress to their connected brittle interior and exterior materials. By design, these Slab-on-grade foundation system (s) are stiff enough to buffer potentially damaging soil and sub-grade material displacement, yet flexible enough to protect their supported structural elements from unsafe or excessive planar tilting.
6. Any sealed engineering design instruments (excluding reports produced by Lineberger Consulting Engineers, Inc.) containing pre-/post- structural foundation information analysis or opinions pertaining to the referenced property address produced before the date of this structural investigation/consultation.
7. This report does not contain a graphic topographic drawing showing foundation surface contours. Relative elevation data are referenced to an arbitrary bench mark within the perimeter of the measured foundation system. Collected elevation data is accurate to within 0.125 inch per 120 inches. Foundation surface topography data, observations & analysis (collected and dated 6.11.2020) are reconciled to a *relative* benchmark – not a *permanent or fixed* benchmark. The foundation surface topography dated 6.11.2020: (1) does not represent a prediction of foundation future structural strength or performance; (2) may not be used to accurately or reliably compare or contrast *past or future* foundation surface topography data, observations or analysis; (3) may not be used for any engineering design purpose; (4) may include climatic tilt adjustments; (5) is not available for public distribution in any form without the express written authorization of Lineberger Consulting Engineers, Inc.
8. **ASCE Deflection Case #1:** “If a foundation profile indicates the deflection is less than the analogous deflection limit of L/360, it is unlikely the foundation is deflected materially unless visible indications show otherwise.” **ASCE Deflection Case #2:** “If a foundation profile indicates the deflection is more than the analogous deflection limit of L/360 and minimal symptoms of deflection are present, then additional information is needed by the engineer to develop a conclusion. The additional information may allow the engineer to determine whether or not the foundation has deflected excessively.” **ASCE Deflection Case #3:** “If a foundation profile indicates the deflection is more than the analogous deflection limit of L/360 and sufficient symptoms of deflection are present, then the engineer generally will be justified in determining that the foundation has deflected excessively.”, (Texas Section ASCE “*Guidelines for the Evaluation and Repair of Residential Foundations – V2, Section 5 Evaluation Criteria, paragraph 5.5 Overall Deflection*”). “Residential foundation systems are expected to remain reasonably flat and level to provide acceptable performance.”, (Texas Section ASCE “*Guidelines for the Evaluation and Repair of Residential Foundations – V2, Section 5 Evaluation Criteria, paragraph 5.1 General*”). “A floor slope greater than 1% is usually noticeable. The Americans with Disabilities Act considers a 2 percent slope too large.”(Texas Section ASCE “*Guidelines for the Evaluation and Repair of Residential Foundations – V2, Section 5 Evaluation Criteria, paragraph 5.7 Tilt*”).
9. New or additional data disclosed to the engineer after 6.11.2020 may impact this report's findings.
10. Structurally damaged items where explicitly labeled “**structurally damaged**”. Note: Slab foundation parge coats are thin layers of porous Portland Cement typically applied to the exposed vertical foundation perimeter beam face surfaces. Parge coatings serve merely to improve the aesthetic appearance of the foundation beam faces. They serve no structural purpose. Parge coatings provide no rust protection to metallic reinforcement members. They are highly porous and allow moisture to easily permeate them. They are not water repellent or water tight.
11. Representative examples of residence material defects or distress consistent with **excessive wood/masonry unit structural frame (walls, ceiling, floors, roof systems) displacement** are:
 - partial withdrawal of drywall panel fasteners (so called “nail pops”) from their supporting structural systems;
 - random interior and exterior brittle material wall covering cracking (e. g. drywall or masonry veneer) @ horizontal or vertical surfaces,
 - random interior brittle material sloped wall or ceiling covering (drywall) cracking or tape delamination,
 - random interior and exterior wall openings which deflect, bend, or become out-of-square over time,
 - random pre-hung door frames which become racked (are not square) over time,

REFERENCE NOTES

- random gapping between door slabs and adjacent door jambs (day-lighting),
- random tile floor coverings connected to wood framed floors;
- random gapping between wall floor molding and floor surfaces.
- Note: “random” means no discernible pattern or uniformity. Generally speaking, moisture and thermal sensitive building materials can displace over time in response to changes in their ambient thermal and moisture conditions. Remedy: There are no known “silver bullet” remedies for excessive wood structural frame displacement. However, some basic principles may be employed to limit any moisture/thermal sensitive material (wood, drywall, masonry mortar, stucco, etc.) excessive displacement:
- Stiffen affected wall & ceiling areas with additional structural bracing members;
- Remove and replace brittle wall & ceiling covering materials with flexible, durable materials which do not under excessive tension conditions.

12. A reasonably serviceable Single Family Residence Slab-on-grade foundation system shall:

- i. resist abnormal or excessive displacement which may impair the reasonable use of its connecting floor, wall, and roof frame structural systems.
- ii. resist abnormal or excessive displacement which may impair the reasonable use of its supported floor, wall, and ceiling/roof brittle covering materials.
- iii. have floor surface conditions which generally promote living space habitability and/or reasonably expected use activities consistent with its residential classification or occupancy.

When compared to similar foundation systems located in similar geographic conditions, a reasonably serviceable foundation system ***performs as would be reasonably expected*** when it fully achieves its intended purpose as indicated in items i, ii, and iii above. Conversely, when compared to similar foundation systems located in similar geographic conditions, a reasonably serviceable foundation system is ***underperforming*** when it does not fully achieve its intended purpose as indicated in items i, ii, and iii above. Note: The Texas Section ASCE *Guidelines for the Evaluation and Repair of Residential Foundations – V2, Section 5 Evaluation Criteria, paragraph 5.1 General* states: ‘Residential foundation systems are expected to remain reasonably flat and level to provide acceptable performance’.

*****END OF REPORT*****