Fittz & Shipman
INC.

Consulting Engineers and Land Surveyors

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Mitch Brackin, R.P.L.S.

August 9, 2022

Estate of Billie Downey
C/O Mr. ~~Mark~~ Keith Downey
408 Cresent Drive
Bridge City, TX 77611

RE: STRUCTURAL ENGINEERING SERVICES
FOUNDATION OBSERVATION
408 Cresent Drive
Bridge City, Texas
Project No. 22001-0054

SUMMARY

At the time of my site visit, it is my opinion the foundation of this residence had experienced some settlement at the front right corner. The settlement is the result of the live oak tree located on the adjacent property. Since you cannot remove the tree, the next best solution is to install a root barrier between the tree and the subject property. See the body of this report for the basis of my opinion.

Dear Mr. Downey:

Per your request, on Friday, August 5, 2022, I made a visual observation of the referenced residence. The following is a report of my observations, conclusions, and recommendations.

LEVEL OF OBSERVATION

LEVEL: This project is limited to a Level A Observation. This level of observation is a report of first impression and includes but is not limited to the following:

1. Interview of the occupant, owner and/or client, if possible, regarding the history and performance of the structure.

2. Request from the client documents regarding the foundation, such as construction drawings, geotechnical reports, previous testing

and inspection reports, and previous repair information. All provided documents will be reviewed.

3. Make visual observations during a site visit walk-through/around of the residence. Our attention/focus during the site visit will be on factors that might influence the foundations performance and on signs of post initial construction differential foundation movement.

4. Preparation of a written report detailing Scope of Observation, Type of Construction, Estimated Age, Observations, Conclusions, Background Information, Recommendations, and Foundation Maintenance suggestions.

Level B and Level C Observations/Investigations are available and fee estimates for the higher levels of service will be provided upon request. A Level B Observations/Investigation includes the above plus relative interior elevations taken throughout the ground floor of the residence. A Level C Observation/Investigation includes Levels A & B items plus soil sampling, site survey, testing of foundation concrete for strength, plumbing investigation, and review of foundation design, if possible.

SCOPE OF OBSERVATION

SCOPE: The purpose of this observation was to observe the condition of the residence's foundation on the day of the site visit. Future performance cannot be predicted but recommendations will be made to maintain or improve future performance. This observation is strictly limited to the foundation. After completing the observation, we were to provide a report outlining our observations, conclusions, and recommendations.

Our quoted fee is for our initial site visit and report only. There will be an additional fee for follow-up site visits and reports unless the follow-up site visit and report is for clarification of our original report. This report is valid for three (3) months from the date of the observation.

TYPE OF CONSTRUCTION

TYPE OF CONSTRUCTION: The residence is a one story wood framed single family residence with brick veneer and exterior siding. The roof framing is hipped with composition shingles. There is an attached two-car garage which is included in this report.

The property has a conventional slab-on-grade foundation system.

ESTIMATED AGE

ESTIMATED AGE: The residence is approximately sixty (60) years old.

OBSERVATIONS

OBSERVATIONS: I observed interior and exterior, structural and non-structural items at exposed conditions. From this, I made the following observations (all references are relatively to viewing the front of the residence from the outside):

1. See Photograph No. 1 for a front view of the residence.

2. Right Elevation - Foundation crack near front right corner. See Photograph No. 2

3. Front Elevation - Brick planter support failed (does not affect the residence's foundation). See Photograph No. 3.

4. Front Left Bedroom - Sheetrock corner tear in closet. See Photograph No. 4.

5. Front Left Bedroom - Sheetrock corner tear in closet. See Photograph No. 5.

6. Front Left Bedroom - Sheetrock corner tear in closet. See Photograph No. 6.

7. Front Right Bedroom - Door will not close completely. See Photograph No. 7.

8. Rear Right Bedroom - Door will not close completely. See Photograph No. 8.

9. Rear Right Bedroom - Sheetrock corner tear in closet. See Photograph No. 9.

10. Rear Right Bedroom - Vertical sheetrock tape joint separation below side window. See Photograph No. 10.

11. Rear Right Bedroom - Diagonal sheetrock crack above master bathroom door (reported to be remodel construction damage). See Photograph No. 11.

12. Front Left Bedroom – Vertical sheetrock tape joint separation above door (not photographed).

13. There is a large live oak tree near the front right corner on the adjacent property.

CONCLUSIONS

CONCLUSIONS: The brick planter crack at the front right corner is not impacting the main foundation of the property and is cosmetic in character.

The residence has experienced differential soil movement in the past. The movement is a result of highly expansive soils, which are common to the area. The soil shrinks or swells with changes in moisture content. As the soil dries, it shrinks; as it becomes moist, it swells. If the shrinking and swelling is not uniform then foundation distress and possible foundation failure can occur. As the moisture content of the soil changes differentially, the slab foundation deflects causing damages such as those listed in Items No. 2, and 4 through 11 under Observation. The settlement is limited to the front right corner and is the result of the live oak tree on the adjacent property. These roots will pull moisture form below the foundation, leaving these soils drier than others under the foundation and causing consolidation. The tree observed and noted in Item No. 13 under Observations appear to have had a major influence on the performance of the foundation. The installation of drilled footings will only result in re-settlement of the foundation unless the tree influence is neutralized. The tree belongs to the neighbor to the immediate right of the property. The only solution is to install a root barrier.

The levelness of a slab-on-grade foundation is not always an indication of differential foundation movement and distress. Often, slab-on-grade foundations are placed in an unlevel manner during construction. If a foundation is unlevel as a result of differential foundation movement, there will be other signs of that differential movement and distress. If those signs are not present, the unlevelness of the slab-on-grade

foundation is a result of construction and not differential foundation movement.

BACKGROUND INFORMATION

BACKGROUND: The following information will be helpful in maintaining the foundation.

Foundation movement in our area occurs when the soils supporting a residence experience a change in moisture content. This change causes the volume of the soils to change; either shrinking or swelling. If saturation of moisture in the soil is to different degrees and at varying rates, differential pressures are exerted on the foundation. If the differential pressures are great enough, the foundation cracks and possible failure of one or more areas of the foundation can occur.

WEATHER CYCLES are a major influence on the moisture content of the soils that support a residence. The perimeter soils, those most exposed to rain and evaporation, experience the most fluctuation of moisture content. This causes the most extreme movement to occur at exterior walls. The weather cycle influence can be exaggerated if the site is poorly or differentially drained.

TREES also have a large influence on the moisture content of soils supporting a residential foundation. As a general rule, a non-pine tree's roots will extend the same distance as its limbs; the drip line. These roots pull moisture from under the residence, leaving those soils drier than others under the residence and causing consolidation. While the weather cycle influence only affects those soils six (6) to eight (8) feet interior of the perimeter, the tree influence can be much more damaging because its effects will exist as far as the roots extend.

HYDRAULICALLY DRIVEN CONCRETE CYLINDERS: "In the late 1980's or early 1990's the process of driving steel mini piles hydraulically was given a novel twist. Rather than using short sections of small-diameter steel pipe, the process uses concrete cylinders approximately 6 in. (15cm) in diameter by 12 in (30 cm) in length. The claims for this method include such statements as "the weight of the building locks the sections of the piling (piers) together with friction" and "the soil through which the pilings have been driven, and which was compacted by the driving process,

firmly locks the pilings (piers) in vertical position." In the absence of strong proof, either allegation would seem most suspect." From a technical view this technique has deficiencies. These include concerns involving alignment, absence of any margin of safety, and failure in lateral stress. "An attempt to improve the alignment has been introduced. This involves threading the cylinders on a posttensioned cable. Once the desired numbers of cylinders are placed, the cable is tensioned, and it is hoped that it will both assure the alignment and develop some tension resistance within the column. The benefits actually realized from this approach are most questionable. The cable might improve the piling's (pier) resistance to tensile forces but would offer little in resistance to lateral stress. Further, the cable might tend to force the cylinders into closer and tighter contact but not likely improve the overall alignment."[1] It has been the experience of ***Fittz & Shipman, Inc.***, that this method of foundation stabilization has not performed adequately for the long-term. We have witnessed instances where the method actually created additional foundation problems including the creation of new foundation lines of failure. ***Fittz & Shipman, Inc.*** does not approve of hydraulically driven concrete cylinders as an acceptable method of stabilization.

RECOMMENDATIONS

RECOMMENDATIONS: Since footing installation will only result in resettlement, the only solution is to install a root barrier. The enclosed plan and root barrier detail shows the recommended root barrier location and construction. The foundation should experience some re-bound after one year has elapsed from date of root barrier installation.

In addition to the root barrier, the foundation will need to be properly maintained. Foundation maintenance is an attempt to maintain constant, uniform moistness in the soils supporting a residence constant throughout the year. By maintaining a constant moisture content, the soil's volume fluctuation and the consequences of foundation movement are minimized. For your reference, an outline of foundation maintenance procedures follows.

FOUNDATION MAINTENANCE

MAINTENANCE: The following maintenance procedures are sensible methods to minimize foundation movement due to shrinking and swelling

[1] R. W. Brown, *Practical Foundation Engineering Handbook*, McGraw-Hill, New York, 1996

soils.

1. After a heavy rain, an inspection should be made to insure there are no areas where water is collecting or that are slow to dry. Drainage should be such that water "runs" uniformly and directly away from the residence.

2. Soils around the slab should be monitored to insure that they do not become too dry; causing shrinking. The planting of small bushes or shrubs around the residence can provide a barometer of soil dryness because the plants dry as the soil dries. Ideally, the soils supporting a slab should maintain a constant moisture content throughout the year. By watering the plants, the soil gets watered. This is sometimes called "watering the slab".

3. At faucet locations, provide drainage away from the residence in order to prevent a dripping faucet from creating an isolated location of saturation. Faucets should not be allowed to drip.

4. The installation of gutters and downspouts around the entire perimeter of a residence is a good idea but not mandatory. If downspouts are installed or presently exist they should have their discharge directed well away from the base of the foundation. The addition of gutters can help stabilize a foundation but good drainage is almost as effective as gutters. If gutters discharge at the base of the foundation they cause washouts and undermining of the foundation.

5. Do not plant large trees close to the residence. As a general rule, a tree's roots extend as far as its drip line. If these roots extend under the slab they will pull moisture from below the slab thus causing isolated areas of dry soil. The result is these soils are relatively consolidated and are at a location where the condition is difficult to remedy. When planting trees, take into consideration its size in twenty to thirty years in determining where to plant the tree. Oak trees especially should be planted a large distance away from residential foundations.

STATEMENT OF LIMITATIONS

LIMITATIONS: This report is not a guarantee or warranty of the foundation, the design, or the soil conditions. It is limited to opinions made as a result of the on-site visit. We are not responsible for out of sight defects. Our opinions were not influenced by any party and our maximum liability is limited to the fee paid. Contact our office if these limitations are not acceptable.

We appreciate the opportunity to be of service to you. If you have any question, please do not hesitate to call.

Sincerely,

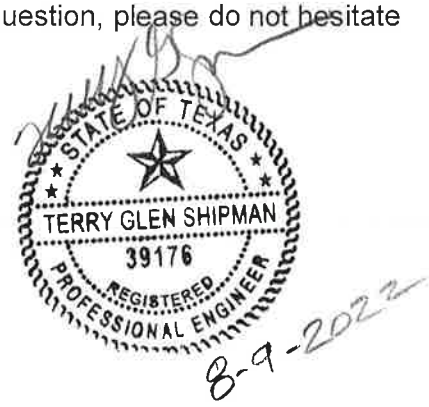
Fittz & Shipman, Inc.

by: Terry G. Shipman, P.E.; MASCE
For the Firm

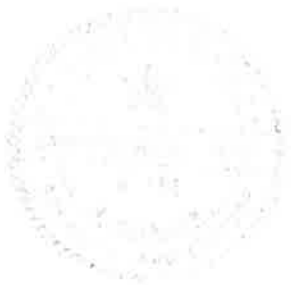
TGS/blp

Email: kdowney@gt.rr.com

Enclosures: Root Barrier Plan
Root Barrier Detail



I am a Registered Professional Engineer in the State of Texas. This seal does not guarantee the existing conditions. See the Statement of Limitations in the body of the report.



Photograph No. 1

408 Cresent Drive
Bridge City, Texas

Photograph No. 2

Right Elevation - Foundation crack near front right corner

Photograph No. 3

Front Elevation - Brick planter support failed (does not affect the residence's foundation)

Photograph No. 4

Front Left Bedroom - Sheetrock corner tear in closet

Photograph No. 5

Front Left Bedroom - Sheetrock corner tear in closet

Photograph No. 6

Front Left Bedroom - Sheetrock corner tear in closet

Photograph No. 7

Front Right Bedroom - Door will not close completely

Photograph No. 8

Rear Right Bedroom - Door will not close completely

Photograph No. 9

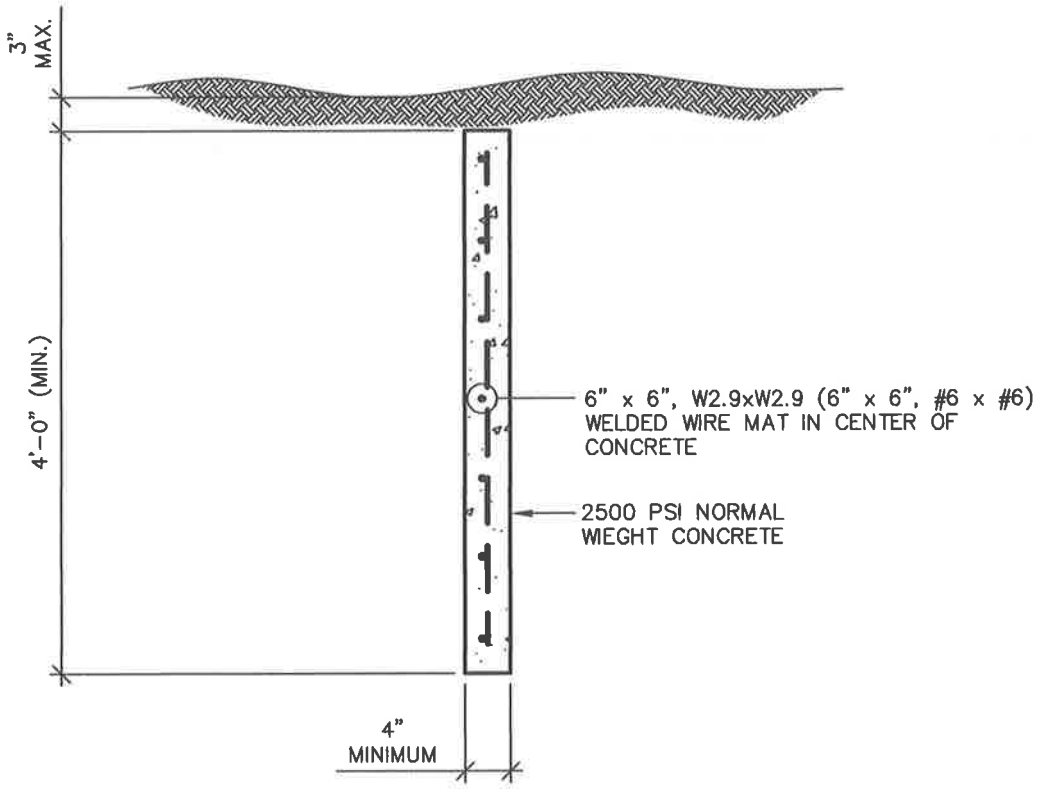
Rear Right Bedroom - Sheetrock corner tear in closet

Photograph No. 10

Rear Right Bedroom - Vertical sheetrock tape joint separation below side window

Photograph No. 11

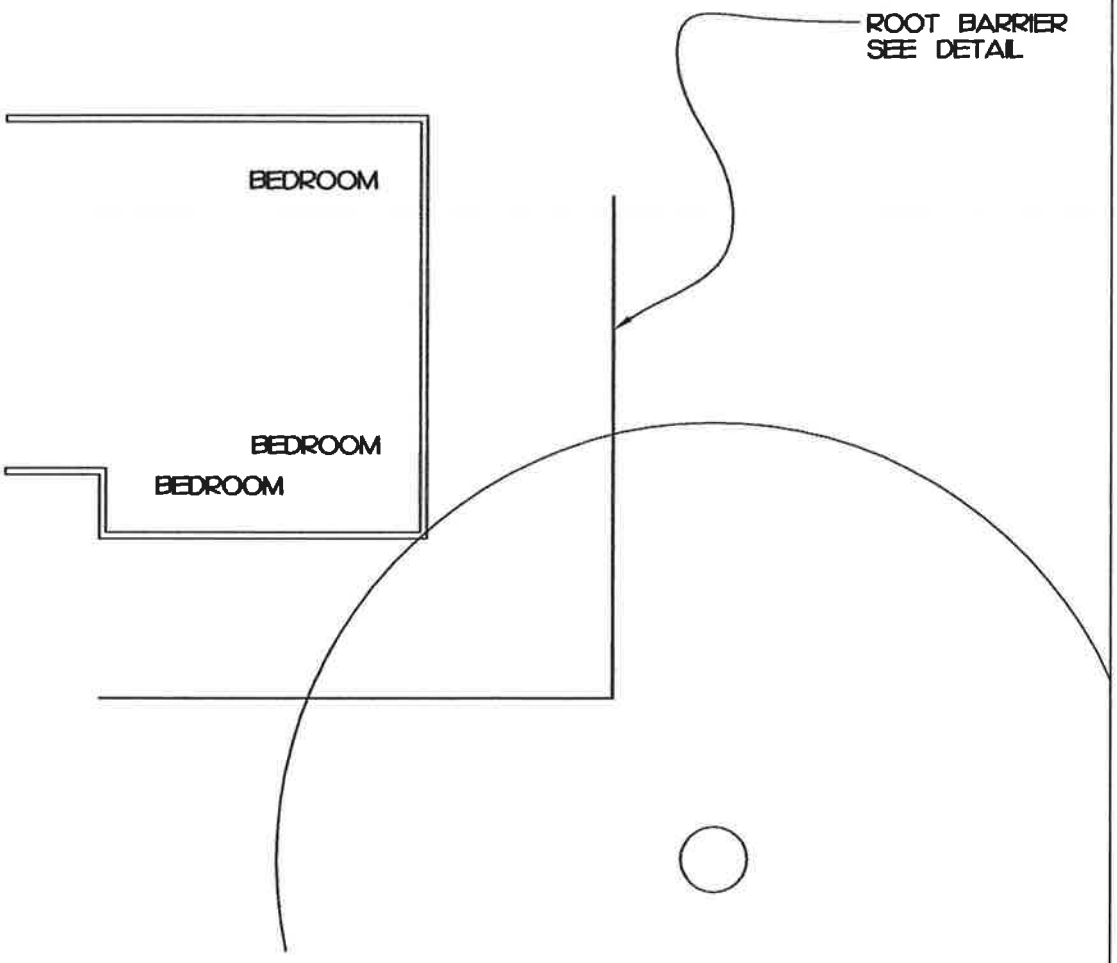
Rear Right Bedroom - Diagonal sheetrock crack above master bathroom door (reported to be remodel construction damage)



ROOT BARRIER

Fittz&Shipman, INC.

NOTE:
SIDEWALKS, FENCES, POOLS,
OUTSIDE UNITS, COVERED OUTSIDE AREAS,
AND OTHER OBSTACLES ARE NOT SHOWN



FOUNDATION REPAIR PLAN
408 CRESENT DRIVE
BRIDGE CITY, TEXAS

INDICATES ROOT BARRIER
OF FOOTING 9'-0" TO 10'-0" BELOW FINISHED GRADE