

September 24, 2015

Jagjit Yadav
87 N Royal Fern Dr.
The Woodlands, Texas 77380
c/o Sarah Johnson – Matt Fajkus Architecture



**Re: Preliminary Foundation Condition Assessment
3800 Balcones Drive**

Dear Jagjit,

This assessment was authorized by Mr. Jagjit Yadav through correspondence with Ms. Sarah. The scope of this assessment is to make visual observations and take limited elevation measurements to determine the structural condition and performance of the existing building foundation.

Field Investigation

On September 23, Timothy Brummett from my office and I met with Marc Molak from Soledad Builders at the house at 3800 Balcones Drive. We made general visual observations around the interior and exterior and took 29 floor levelness measurements within the house using a digital water level. This investigation generally meets a Level B Investigation as described in the "Guidelines for the Evaluation and Repair of Residential Foundations" prepared by the Texas Section of American Society of Civil Engineers (Texas ASCE).

This assessment is limited to measurements of the floor levelness in selective locations and on visual observations only.

Floor Levelness

Our floor levelness measurements are noted on a floor plan diagram with approximated one inch contours drawn and is attached as Figure 1. Areas of terrazzo floor and tile floor appear to be at approximately the same datum above concrete slab and the areas of carpet appear to be approximately 0.1 inch higher. We measured an 11.3 inch drop from back of the house in the bathroom near the carport down to the front near the windows in the living room (taking in account the 41.4 inch floor step from kitchen to living room), about 46 feet in separation distance, which is approximately a 1:51 average slope. Within the lower living room, there is a drop of 4.6 inches over 16 feet which is approximately 1:41 slope.

For comparison purposes, the building code historically required flat or low slope roof systems to have a minimum slope of 1/8 inch per foot which is a 1:96 slope. Current building codes are more demanding

- 1/2 inch for bullfloated surface,
5/16 inch for straightedged surface,
3/16 inch for flat surfaces, and

1/8 inch for very flat surfaces

For this residential construction, it's reasonable to expect a tolerance of 5/16 inch to 3/16 inch (slope of 1/192 to 1/320) for the relatively high quality residential finishes, and 1/2 inch (1/120) is the lowest quality slab.

The Texas ASCE guidelines recommend that uniform tilt of a slab might not be considered as problematic to a structure as variations in elevation in the slab since that would not tend to cause very much stress and damage to structural systems or finishes. It describes that a slope of 1% (1:100) is generally considered perceptible and a slope of 2% (1:50) is considered too large.

Building code criteria for design of residential structures limits midspan deflection of a floor slab or beam to be less than span over 240 which equates to average slope of 1:120 from center of span to the end of the span.

It is common in new construction to limit the expected movement of a foundation system to 1 inch total and 1 inch differential. Some find this too restrictive and would allow foundation movement of 2 inches or perhaps a little more.

Framing and Finish Observations

We observed a number of cracks in the terrazzo finish within the living room and kitchen areas with moderate sizes ranging from hairline up to about 1/8 to 3/16 inch in width. There are a few cracks in the stone walls and the fireplace and chimney masonry that are about 1/8 inch 1/4 inch in width. There are cracks in some of the gypsum board finishes, and there are doors that are racking within their frames. The house appears to be generally rotating rather than isolated areas of the house shifting differentially and bending so the framing is undergoing relatively uniform rotation. There is a carport roof connecting the main house to the shed at the west and this is likely providing a little restraint to the house framing, but the structure of the main house is much more robust and would be pulling the shed laterally to a greater degree than the shed restrains the house. We did not measure plumbness of walls. The wood framed structure appears to be in reasonably good condition within the interior of the house with signs of some shifting and distress. There are areas of framing, especially where exposed to the exterior, that have severe weathering damage.

The stone landscape walls have a number of locations where the walls are significantly tilted appearing to have shifted with differential horizontal measurement of 9 inches or more. It's likely that the adjacent segments of all have also shifted laterally, and so the total amount of lateral movement could be 12 inches or more. There are cracks larger than 1 inch. These walls are separate from the main house structure and not integrated. They provide us with an understanding of the general soil activity on the site.

Soil Conditions

Balcones drive runs along the base of Mount Bonnell and along both sides of the inactive Mount Bonnell Fault as well as near other inactive minor faults. In this lower end of the road, the underlying soils are highly variable with fairly good quality Edwards Formation limestone, Georgetown formation limestone, Buda Formation limestone and Del Rio Formation clays. Nearby there are also Eagle Ford Formation clays. The faulted zones within the limestone is often highly weathered. Soils tend to be highly mixed in areas of known faulting.

On this lot, we expect there are severely expansive soils which will swell and lift this house when saturated, and shrink and drop the house when dry. This action, when combined with the slope of the natural grade, during seasonal moisture change, will heave and shrink and cause downward creep and rotation of the building.

Under heavy rain on the hill, soil erosion would combine with this creep causing the house to drop on the lower grades. During routine but high water flow in the creek, the soils below would erode and contribute to some overall soil instability and erosion. The movement is likely to proceed more rapidly over time as the lateral pressures on the soils increase, the bending and shear stresses on foundation elements increase and foundation elements progressively fail. Eccentric overturning loads on all of these elements will compound the effect.

Groundwater migrates through varying layers of soils and rock below grade and generally will accumulate in seams containing more porous materials such as sands, gravels and fragmented limestone. In a hillside condition like this, there may be porous seams where water can escape and create erosion as well as seasonal drying and wetting.

The creek at the base of this property has alluvial deposits of gravels, sands, silts and clays. There is an Erosion Hazard Zone identified by Southwest Engineers in their report dated May 30, 2015 that extends from the creek to roughly halfway into the plan of the existing house. This existing house would likely be unstable in the flood event they investigated and at risk of collapse.

The movements that this house is experiencing in the magnitude of more than 11 inches would very likely cause plumbing failures including water, wastewater and gas. It's quite possible that some of the plumbing repairs that have been performed already as recorded in the City of Austin permit office are a result of such failure. It is very likely that plumbing failures will happen if this foundation is not stabilized. Whenever water or wastewater pipes fail, the resulting water flow through the foundation soils will immediately and drastically cause soil swelling and erosion.

Recommendations

In our opinion, the slope on this building is unacceptable and should be brought to near level condition. We also believe that the house is undergoing substantial foundation movement and requires stabilization to prevent ongoing movement, damage and ultimately failure.

We recommend that the foundation be stabilized with drilled piers and then the slab leveled prior to performing any remodeling work. Although we don't know how the foundation was constructed, we are assuming for now that it is a stiffened slab on grade.

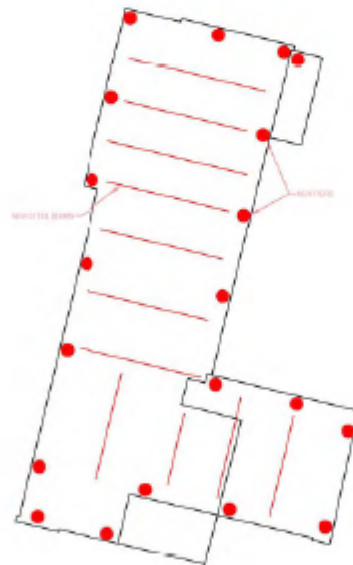


Figure 2: Foundation Retrofit Diagram

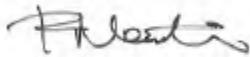
Based on our experience with similar soil types in Austin, we have made assumptions of possible pier end bearing values and uplift forces and develops a preliminary concept plan for the foundation remedial work with the following approximations for the purposes of budgeting the work and shown diagrammatically on the attached plan Figure 2:

1. Drilled piers would be situated under perimeter beams and spaced at about 15 to 20 feet on center. We would attempt to avoid locating new piers within the building interior due to overhead clearance limitations for drilling equipment. We anticipate 18 to 22 piers total. If the piers were 12 inches diameter, they would need to be approximately 25 to 30 feet deep if embedded into clay, or approximately 5 to 8 feet embedment into limestone if encountered.
2. The concrete beams and slab would need to be elevated above the soil to separate them from shrinkage and swelling due to seasonal moisture change. Soil under the slab would be excavated and interior beams and slabs would require temporary shoring during this work.
3. New internal steel beams would be installed spanning to perimeter beams and piers to support the interior beams and slab. Beams are expected to be between 10 inches to 14 inches in depth and with a budget quantity of 5 tons. We assume these would need to be located at approximately 6 to 9 feet on center to suit existing concrete span capabilities. Shims would be installed to tie the steel beams to concrete beams and slabs. The crawl space created could be as minimal as practical for access. Potentially 2 feet clear under beams.
4. Perimeter vents would need to be created through existing beams.
5. The existing shallow perimeter beams would need to be retrofitted with deeper beams to retain soil from sloughing into the crawl space.
6. During the repair process, finishes and framing will likely be damaged and would require repair or replacement.

Alternate methods of retrofit would need to be investigated during a remodel or renovation design process.

Please feel free to contact me with any questions and I will gladly clarify anything.

Sincerely


Richard A. Martin, PE
Principal
MJ Structures, PLLC (F-7796)



ARTICLE 6



Cost Estimation for New Construction

Name: Balcones

| | Total Cost | Price/Sqft |
|---|---------------------|-----------------|
| Site Supervision and Mileage | \$34,000.00 | \$13.60 |
| 01 00 00 (Builder's Risk Insurance) | \$3,500.00 | \$1.40 |
| 01 43 33 (Inspections) | \$1,500.00 | \$0.60 |
| 01 52 19 (Temp Fence/Chem. Toilet) | \$2,800.00 | \$1.12 |
| 01 57 16 (Pest Control) | \$800.00 | \$0.32 |
| 01 74 00 (Trash/Porter/Haul) | \$3,500.00 | \$1.40 |
| 01 74 16 (Site Maint./General Make Rm) | \$2,500.00 | \$1.00 |
| 01 74 23 (Final Clean) | \$1,000.00 | \$0.40 |
| 01 78 46 (Material and supplies) | \$1,250.00 | \$0.50 |
| 02 40 00 (Demolition and Prep) | \$14,500.00 | \$5.80 |
| 04 21 13 (Masonry/Brick or Stone) | \$11,500.00 | \$4.60 |
| 05 00 00 (Metal & Welding) | \$5,000.00 | \$2.00 |
| 06 10 00 (Framing Labor) | \$26,000.00 | \$10.40 |
| 06 11 00 (Framing Material) | \$35,000.00 | \$14.00 |
| 06 20 00 (Trim Labor) | \$9,400.00 | \$3.76 |
| 06 22 00 (Trim material) | \$10,850.00 | \$4.34 |
| 06 41 00 (Millwork/Cabinetry) | \$40,000.00 | \$16.00 |
| 07 15 00 (Sheet Metal Waterproofing) | \$2,000.00 | \$0.80 |
| 07 20 00 (Insulation) | \$9,750.00 | \$3.90 |
| 07 70 00 (Roofing) | \$16,500.00 | \$6.60 |
| 07 71 23 (Gutters) | \$3,000.00 | \$1.20 |
| 08 10 00 (Doors & Frames) | \$7,500.00 | \$3.00 |
| 08 36 00 (Panel Doors/Garage) | \$5,000.00 | \$2.00 |
| 08 30 00 (Windows & Sliders) | \$20,000.00 | \$8.00 |
| 08 70 00 (Hardware) | \$4,000.00 | \$1.60 |
| 08 83 00 (Mirrors) | \$1,500.00 | \$0.60 |
| 09 20 00 (Drywall & Texture) | \$19,500.00 | \$7.80 |
| 09 30 00 (Ceramic Tile) | \$17,800.00 | \$7.12 |
| 09 60 00 (Flooring) | \$28,000.00 | \$11.20 |
| 09 91 13 (Exterior Painting) | \$5,000.00 | \$2.00 |
| 09 91 23 (Interior Painting) | \$13,750.00 | \$5.50 |
| 10 28 00 (Accessories) | \$1,000.00 | \$0.40 |
| 10 28 19 (Glass-Shower/Tub) | \$2,000.00 | \$0.80 |
| 10 30 00 (Fireplace) | \$5,000.00 | \$2.00 |
| 11 31 00 (Appliances) | \$15,000.00 | \$6.00 |
| 12 36 00 (Countertops) | \$15,000.00 | \$6.00 |
| 22 00 00 (Plumbing) | \$21,500.00 | \$8.60 |
| 22 40 00 (Plumbing Fixtures) | \$12,500.00 | \$5.00 |
| 22 41 23 (Res. Shower Pan) | \$1,600.00 | \$0.64 |
| 23 00 00 (HVAC) | \$13,000.00 | \$5.20 |
| 26 00 00 (Electrical) | \$19,100.00 | \$7.64 |
| 26 30 00 (Lighting Fixtures) | \$10,000.00 | \$4.00 |
| 31 60 00 (Foundation) | \$75,000.00 | \$30.00 |
| 32 00 00 (Paving) | \$10,000.00 | \$4.00 |
| 32 90 00 (Minor Landscaping and Fences) | \$7,500.00 | \$3.00 |
| 40 14 49 (Natural Gas Piping) | \$1,400.00 | \$0.56 |
| Subtotal | \$566,000.00 | \$226.40 |
| Overhead and Profit | \$106,400.00 | \$42.56 |
| Total | \$672,400.00 | \$268.96 |

We do not charge O&P to Site Supervision/Mileage

Architect: MF Architecture

Description: Ground-up with pier & beam foundation. Minimal landscaping. 2,500 s.f.

Timeline: 270 calendar days



Cost Estimation for Restoration

Name: Balcones

| | Total Cost | Price/Sqft |
|---|---------------------|-----------------|
| Site Supervision and Mileage | \$46,200.00 | \$18.48 |
| 00 00 00 (Engineering/Survey) | \$2,500.00 | \$1.00 |
| 01 00 00 (Builder's Risk Insurance) | \$5,100.00 | \$2.04 |
| 01 45 33 (Inspections) | \$4,900.00 | \$1.96 |
| 01 52 19 (Temp Fence/Chem. Toilet) | \$2,800.00 | \$1.12 |
| 01 57 16 (Pest Control) | \$800.00 | \$0.32 |
| 01 74 00 (Trash/Porter/Haul) | \$5,500.00 | \$2.20 |
| 01 74 16 (Site Maint./General Make Ready) | \$2,500.00 | \$1.00 |
| 01 74 23 (Final Clean) | \$1,000.00 | \$0.40 |
| 01 78 46 (Material and supplies) | \$1,250.00 | \$0.50 |
| 02 40 00 (Demolition and Prep) | \$12,000.00 | \$4.80 |
| 03 00 00 (Excavation and Retaining Walls) | \$30,000.00 | \$12.00 |
| 04 21 13 (Masonry/Brick or Stone) | \$11,500.00 | \$4.60 |
| 05 00 00 (Metal & Welding) | \$5,000.00 | \$2.00 |
| 06 10 00 (Framing Labor) | \$35,750.00 | \$14.30 |
| 06 11 00 (Framing Material) | \$9,800.00 | \$3.92 |
| 06 20 00 (Trim Labor) | \$9,400.00 | \$3.76 |
| 06 22 00 (Trim material) | \$10,850.00 | \$4.34 |
| 06 41 00 (Millwork/Cabinetry) | \$40,000.00 | \$16.00 |
| 07 15 00 (Sheet Metal Waterproofing) | \$5,000.00 | \$2.00 |
| 07 20 00 (Insulation) | \$9,750.00 | \$3.90 |
| 07 70 00 (Roofing) | \$16,500.00 | \$6.60 |
| 07 71 23 (Gutters) | \$3,000.00 | \$1.20 |
| 08 10 00 (Doors & Frames) | \$7,500.00 | \$3.00 |
| 08 36 00 (Panel Doors/Garage) | \$5,000.00 | \$2.00 |
| 08 50 00 (Windows & Sliders) | \$20,000.00 | \$8.00 |
| 08 70 00 (Hardware) | \$4,000.00 | \$1.60 |
| 08 83 00 (Mirrors) | \$1,500.00 | \$0.60 |
| 09 20 00 (Drywall & Texture) | \$19,500.00 | \$7.80 |
| 09 30 00 (Ceramic Tile) | \$17,800.00 | \$7.12 |
| 09 60 00 (Flooring) | \$28,000.00 | \$11.20 |
| 09 91 13 (Exterior Painting) | \$5,000.00 | \$2.00 |
| 09 91 23 (Interior Painting) | \$13,750.00 | \$5.50 |
| 10 28 00 (Accessories) | \$1,000.00 | \$0.40 |
| 10 28 19 (Glass-Shower/Tub) | \$2,000.00 | \$0.80 |
| 10 30 00 (Fireplace) | \$5,000.00 | \$2.00 |
| 11 31 00 (Appliances) | \$15,000.00 | \$6.00 |
| 12 36 00 (Countertops) | \$15,000.00 | \$6.00 |
| 22 00 00 (Plumbing) | \$34,950.00 | \$13.98 |
| 22 40 00 (Plumbing Fixtures) | \$12,500.00 | \$5.00 |
| 22 41 23 (Res. Shower Pan) | \$1,600.00 | \$0.64 |
| 23 00 00 (HVAC) | \$13,000.00 | \$5.20 |
| 26 00 00 (Electrical) | \$25,575.00 | \$10.23 |
| 26 50 00 (Lighting Fixtures) | \$10,000.00 | \$4.00 |
| 31 60 00 (Foundation) | \$160,250.00 | \$64.10 |
| 32 00 00 (Paving) | \$10,000.00 | \$4.00 |
| 32 90 00 (Minor Landscaping and Fencing) | \$7,500.00 | \$3.00 |
| Subtotal | \$703,525.00 | \$281.41 |
| Overhead and Profit | \$131,463.00 | \$52.59 |
| Total | \$834,990.00 | \$334.00 |

Architect: MF Architecture

Description: Renovation with extensive foundation foundation repairs. Minimal landscaping.

Timeline: 360 calendar days

We do not charge O&P to Site Supervision/Mileage



Cost Estimation Summary

Name: Balcones

| | |
|---|----------------|
| Original Purchase Price | \$856,000.00 |
| Restoration | \$834,990.00 |
| Total Cost | \$1,690,990.00 |
| PPF | \$676.40 |
| | |
| New 2500 Sq. Ft. Home | \$672,400.00 |
| Lot | \$856,000.00 |
| Total Cost | \$1,528,400.00 |
| PPF | \$611.36 |
| | |
| Difference between a new 2,500 SQ FT home and 2,500 SQ FT restoration | \$162,590.00 |