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Redacted Name
Redacted Address
Austin, Texas 78704

24 April 2003

Ref: Foundation Condition at 1905 Redacted Avenue, Austin 78704.

Mr. & Mrs. Redacted:

At your request we visited the subject property on 22 April 2003.

PURPOSE AND SCOPE

The purpose of the site visit to observe and measure accessible areas of the foundation. The purpose of this report is to describe the foundation systems, document apparent deficiencies in performance and provide subjective recommendation whether repairs are indicated.

The scope of this service is limited to superficial facilities inspection via routine means, in accordance with our provided Evaluation Proposal. This report is not exhaustive. Mechanical and utility systems are not considered and some types of obvious damage are not noted. Concealed discrepancies and latent defects cannot be reported. No site-specific geotechnical investigation has been undertaken.

SITE DESCRIPTION

The shaded, interior suburban lot gradually slopes from front to rear, with the house sited at about street level. Because of the natural slope, the house floor is roughly at-grade near the right front and 4-5' above grade at the left rear. Lot perimeter drainage appears negative at the right (drainage from the adjacent properties) and adequate at other areas. The rear of the lot (well away from the house) is a steeper slope.

The building is a two-story light-framed residence. The original house foundation consists of wooden (cedar) tree trunks. Details of any bearing pads are unknown. The floor structure consists of wooden beams (mostly 4x6, but laid sideways) with wooden (2x6) joisting. There is no subfloor membrane or insulation.

The original house walls appear to be panel-built ('stressed-skin') wood construction with interior shiplap and exterior tongue-in-groove sidings. The attic is completely inaccessible (2x4 stick framing would be consistent with the rest of the house). The roof covering is lightweight (exposed fastener) metal panels.

The house has obviously been repeatedly modified and expanded since original construction. A rear extension of 9-10' (where the lower bath, kitchen, etc. are now) appears to have been added to the original construction. The attic has been converted into living spaces and is completely finished-out. At the rear of the house is a partially enclosed area supported by abutting slabs. At the front of the house is a large dormer portico, also slab-supported.



Front Elevation



Rear Elevation

This is modified (urbanized) land in South Austin and no site-specific geotechnical data are available. Published reference¹ indicates this site overlies urbanized Eddy soils (EuC). These are generally grayish-brown, gravelly loams and clay loams which exhibit low bearing strengths but relatively low plasticity (shrink-swell or moisture reaction) compared to surrounding exposures.

¹ USDA, "Soil Survey of Travis County, Texas," issued 1974. This location is on sheet 62.

Soils here are well-drained. In other repairs in the neighborhood (Travis Heights on side slopes of Blunn Creek) we have encountered very shallow groundwater. These soils are also remarkably alkaline and resistive, making them corrosive to uncoated ferrous (steel) components. Mapped soil depths are shallow to moderate (1-3'), although these are more variable on eroded (or backfilled) slopes. The associated geology is Austin formation² and bedrock is soft chalk.

Shallow-bearing foundation elements on natural soils are subject to movement here, specifically subsidence in response to weather-dependent saturation of supporting soils. Interior areas of grade-bearing slabs and site flatwork are supported by imported fill materials. These typically exhibit settling and/or erosion potential, particularly with poor drainage.

Visible perimeter and crawlspace soils were grayish-brown clay loams, but there was little gravel or chert present, more consistent with Austin-Brackett complex than Eddy soils. Ground cover was in fair to poor condition.



BACKGROUND

Clients are prospective buyers and request evaluation of the foundation condition. The visit was conducted from 10am to noon. Mr. Redacted was present, as were others.

The original house appears to be at least 50 years old, with many additions or modifications.

² UT Geology Department, "Economic Geology of the Austin Area," issued 1986. See plates I & VII.

OBSERVATIONS

1. The house rooflines and siding courses are visibly distorted. The exterior walls are at least an inch out-of-plumb.
2. There is inadequate freeboard (clearance between the ground and the wooden floor structure), notably at the right quarter of the house. The corresponding crawlspace areas are inaccessible.
3. Drainage at the front and right lawn areas is negative (sloping toward the crawlspace). Where the front roof valleys (formed by the portico dormer) terminate, there is ponding. There are also eroded paths through crawlspace where water has been draining.
4. The original house post supports are severely deteriorated due to rot (ground contact) and insect damage (subterranean termites).
5. Sonotube repair posts (6-8" in diameter) have been installed adjacent many of the original support locations, but these do not appear to be of substantial construction, although no attempt was made to excavate footings. One of these posts (near the rear of the original house) has completely rotated out from beneath a beam.
6. Dry-stack (CMU block) shoring has also been installed at many locations throughout the crawlspace. These appear to bear on precast cement pads placed on grade.
7. There are also many areas of local cribbing, where beams are shored on dry-stacked blocks or wooden 'stifflegs' have been added.³
8. Some termite damage was evident at the beams, but the (visible) interior surfaces appeared remarkably well-preserved considering the age of the house. They were installed sideways (with the minor dimension vertical) at original construction.
9. At the right side of the crawlspace (where the exterior soil is high) there appears to be solid stacks of masonry blocks at the underpinning. The exterior underpinning appears to be cast concrete.
10. Areas of the joisting (2x6, roughly at 24" centers) appear to be overspanned,⁴ most notably at the rear portion of the central living area.
11. Antiquated subgrade (buried) plumbing materials are in service (supply and drains). Some above grade leakage was apparent in the crawlspace.
12. Interior walls exhibit past drywall cracks and repairs. Interior fitments are visibly racked.

³ The original construction and subsequent modifications, combined with the level of finish-out, make determining the actual load paths through this house a daunting, if not downright infeasible, task.

⁴ About 8'6" is allowable for living areas, 9'4" for bedrooms under current model codes. See IRC Table R502.3.

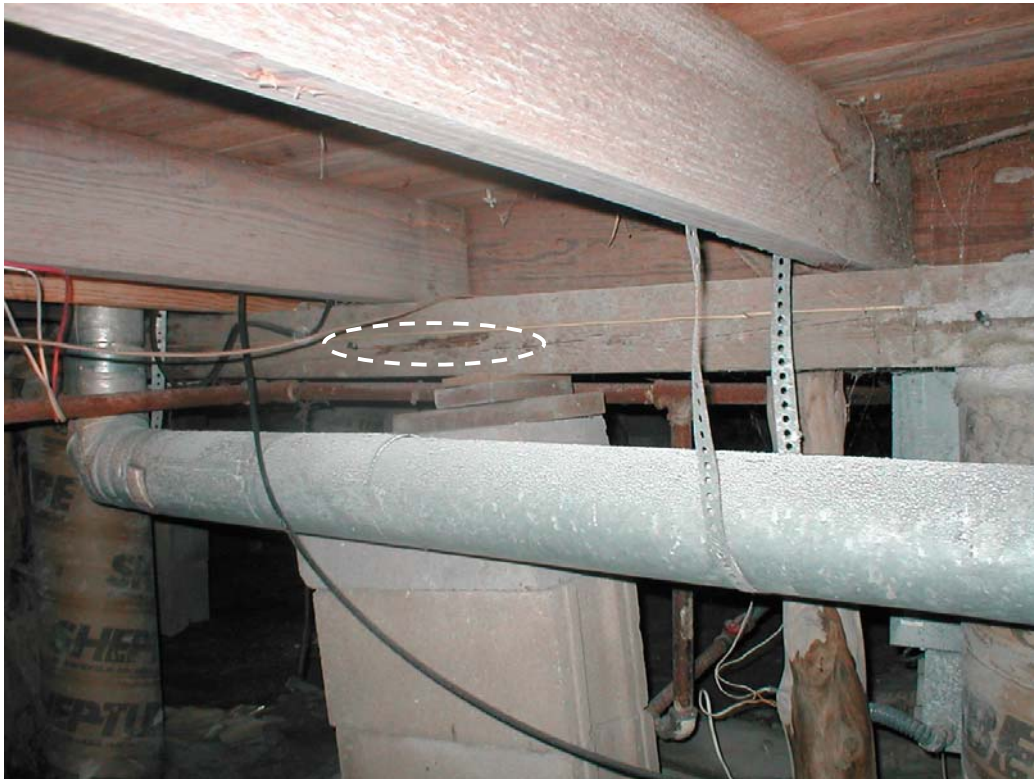
13. cursory elevation measurements indicate that the lower floors are sloping towards the exterior walls. Using the stair landing as a baseline, the left front corner is down 4.2", the right front corner is down 1.1", the left rear corner is down about 0.7" and the right rear corner is down about 1.1". There are excessive floor slopes⁵ at the left room and near the corner of the right front room. Interestingly, the upper floors exhibit a little less than half of the corresponding slope.⁶

⁵ Arbitrarily defined as 1:120 for purposes of evaluation, a liberal criterion. Local slopes at the left side were more like 1:80.

⁶ This suggests that some slope was compensated for during framing of the upper floors. Note that none of this is conventional framing.



View at Rear Crawlspace (upset sonotube, dry-stack shoring, 'ad-hoc' cribbing, etc.)



View at Interior Beam (dry-stack shoring, old post support, termite galleries, etc.)



View of Corner Support (left front)



View of Beam Connection Support (rear, left side)



There are a lot of improvised supports in this crawlspace.

DISCUSSION

This foundation exhibits obvious differential movement, indicated by tilting walls, sloping floors, racking fitments, etc. Based on the condition of the interior finishes, this appears to be a slow, progressive perimeter subsidence, notably at the corners. This is basically attributable to the combination of inadequate (wooden trunk) post supports and poor site conditions. Over the years this has been periodically redressed somewhat by the repeated addition of shallow shoring and cribbing, along with areas probably braced for additional loads as the upper floor was finished-out.

The amount of accumulated shoring here is remarkable. With this many support points, most of the floors exhibit little live load deflection (they 'feel' solid). However, all of these footings appear to be very shallow-bearing and are subject to continual differential settlement due to soil moisture effects.

At this point the floors in the house need leveling and the extent of distortion here is functionally irreparable. These are both obvious indications for foundation repair or replacement. However, we observed no immediate structurally hazardous conditions.

This situation is complicated to address systematically, because:

- Most of the existing supports will interfere with excavation for new footings.
- The amount of accumulated structural modifications over the years is remarkable, making typical empirical repair assumptions and new beam layouts much more complex.
- Portions of the right crawlspace are inaccessible and the foundation work done in this area appears to be unique (unknown) in design and configuration.
- Further excavation and removals are likely to reveal additional discrepancies.

In addition to substantial, engineered footings, the other major consideration in rehabilitation of this foundation is crawlspace moisture. Inadequate grading around the front corners, eave splash from the front valleys and high soil grading (right side) all appear to be contributing to transient periods of excessive moisture in supporting soils.

Less obvious, the buried portions of the supply and drain lines are ferrous materials within the crawlspace. The expected useful life of these materials has been exceeded and they place the foundation at-risk for concealed (subgrade) leakage.



View of Galvanically Incompatible Supply Connection (leaking)



Improvised Piping Support (utility branch)

As regards the slabs (at front and rear), these hybridize the foundation, and tend to introduce differential settlement.⁷ The rear arrangement appears to be two separate slabs, the inner one sloped like a porch. This is not a substantial arrangement to bridge with wall structures. Although the slope and construction joint are obvious, we observed no particular movement-related distress.

RECOMMENDATIONS

As regards the foundation, a complete replacement of the footings and posts supports should be considered. A repair of this magnitude and complexity should only be attempted by an experienced foundation contractor under the immediate supervision of a licensed engineer (P.E.). A detailed specification for repair is beyond the scope of this report. There is a trade-off between using some of the existing beams (with more footings) or upgrading all the beams as well. This decision may be appropriately deferred until the crawlspace skirting is removed and the outer surfaces of the beams can be inspected.

Footing and beam replacement will also allow some re-leveling of the house, but it is very unlikely it can be restored to a nominal level and plumb condition.

As regards performance of a replaced foundation, a comprehensive repair approach to concurrently reduce the potential for moisture ingress into the crawlspace yields the best effect. An optimal scenario would be to remove the skirting, excavate the right side, remove antiquated buried plumbing, install a new foundation, then replace the plumbing and skirting. A substantial repair effort would include, but not be limited to:

1. Installation of appropriate concrete pad footings and post supports (as specified by an engineer).
2. Removal of all existing support structures which are termite-conducive (tree trunks, dry-stacks) or surface bearing (apparently most of everything else).
3. Removal or permanent abandonment (in-place) of all wet-service ferrous plumbing materials.
4. Crawlspace excavation sufficient to provide at least 16" clearance beneath the floor structure.
5. Exterior excavation sufficient to provide at least 6" freeboard to any wood and a six-foot, gradually crowned slope away from the perimeter.
6. A retaining wall and drainage provisions to support the slope cut required for number 5.
7. Guttering at the front drip edges, with piped conveyance to the rear lot slope.⁸
8. Installation of new beams as necessary to support ALL of the points where interior shoring has been added.
9. Installation of additional (shaker) beams to keep floor joist spans within current code allowables.
10. Detailed inspection (or complete replacement, see above) of the perimeter beams.

⁷ Shallow slabs tend to settle down, and away from, abutting pier/beam.

⁸ Note guttering will require regular, sometimes frequent, maintenance due to the huge tree canopy.

11. Repair of termite-damaged joists (by sistering a pressure-treated joisting).
12. Leveling, as practical (see comments above).
13. Certification of the footing configurations and beam installations by a licensed engineer.

Some rough-order cost estimates for this scope of repair are enclosed.

RECOMMENDATIONS FOR FOUNDATION MAINTENANCE (STANDARD)

The supporting soils at this residence include components which shrink and swell with changing moisture content. For this reason, a maintenance program should be followed to include keeping the moisture content of soil around the foundation perimeter constant and uniform. We generally recommend guttering roof drip edges over lawn areas. Exterior stormwater and condensate drains should be extended 36-48" from the foundation perimeter, preferably downslope. Any low areas adjacent to the foundation should be filled. Do not operate the sprinkler system in wet weather (most systems are installed without rain sensors). During dry weather periods, routine watering to keep healthy grass green (about 1" per week) is ordinarily sufficient to keep the soil uniformly moist.

CERTIFICATION

I hereby certify that I am a Professional Engineer licensed in the State of Texas, that I have no personal interest in the inspected property nor anyone involved with the property, and that this inspection was performed in a diligent manner to accurately represent conditions on the date of survey.

Stone Creek Engineering Services, Inc. is a registered engineering service provider in Texas.

GENERAL LIMITATIONS

The facilities inspected are not new. The superstructure is highly modified and extremely finished-out. Various wall, floor, ceiling coverages and/or household goods prevent observation of many surfaces. Concealed discrepancies and/or latent defects necessarily limit the accuracy and scope of this report. There was no geotechnical soil analysis available for review.

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Please contact us if additional information becomes available for analysis, or if you have any questions.

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Russell D. Strahan, P.E.
Consulting Engineer / Inspector
Stone Creek Engineering Services, Inc.

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enclosure