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Project No. ASR14-003-00
March 10, 2014

Mr. Paul C. Jimenez
Special Projects Manager – East Side
City of San Antonio
Center City Development Office
856 Gembler Road
San Antonio, Texas 78219

RE: Forensic Study of Existing Foundation Components
Sterling Building
1432-1434 E. Commerce Street
San Antonio, Texas

Dear Mr. Jimenez:

RABA KISTNER Consultants, Inc. (RKCI) is pleased to submit this report to our Client, the Center City Development Office (CCDO) of our Forensic Study of Existing Foundation Components for the Sterling Building located at 1432 to 1434 E. Commerce in San Antonio, Texas. This study was performed in accordance with our RKCI Proposal No. PSR13-147-00 (Revised) dated December 13, 2013 and the Professional Services Agreement between the Client and RKCI. Written authorization for this study was received by RKCI on January 21, 2013. The purpose of this study was to assist the CCDO in performing its due diligence to evaluate the as-built condition of select foundation elements and soil conditions beneath the facility for possible reuse of existing foundation components.

We appreciate the opportunity to be of service to you on this project. Should you have any questions about the information presented in this report, or if we may be of additional assistance, please call.

Very truly yours,

RABA KISTNER CONSULTANTS, INC.

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Attachments

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FORENSIC BUILDING STUDY FOR

For

THE STERLING BUILDING
1432 TO 1434 E. COMMERCE STREET
SAN ANTONIO, TEXAS

Prepared for

CITY OF SAN ANTONIO CENTER CITY DEVELOPMENT OFFICE
San Antonio, Texas

Prepared by

RABA KISTNER CONSULTANTS, INC.
San Antonio, Texas

PROJECT NO. ASR14-003-00

March 10, 2014

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INTRODUCTION

RKCI has completed the authorized forensic study of existing foundation components within the Sterling Building, situated at 1432-1434 E. Commerce Street in San Antonio, Texas. This report briefly describes the procedures utilized during this study to evaluate the as-built condition of select foundation elements and soil conditions that currently exist beneath the Sterling Building and presents our findings along with our opinions for our Client's consideration in determining the future reuse of this facility.

PURPOSE

The purpose of this project was to assist the Center City Development Office (CCDO) in performing its due diligence to evaluate the as-built conditions beneath the facility for possible reuse of existing foundation components.

BACKGROUND INFORMATION

On the basis of our review of the structural assessment report prepared by Alpha Consulting Engineers, Inc., dated December 10, 2012 and our preliminary walk-through performed on October 24, 2013, we understand that the structures are believed to have been constructed sometime around the 1920's and were originally constructed as adjacent structures with a common wall. The original structures are comprised of a combination of slab-on-grade, and wood post and beam construction. In addition, a partial basement is located near the southeast corner of the building.

SCOPE OF WORK

To accomplish the work, RKCI performed the following scope of work:

Task 1 – Soil Borings Three (3) interior borings and one (1) exterior boring were performed at select locations for the referenced structure. The purpose of this work is to assess the subsurface conditions of the samples. For the locations of the soil boring please refer to Figure 1 of Attachment A. The interior borings, performed by Geotest Services, Inc. (RKCI's sub-contractor for performing the soil borings and test pits) were advanced with the use of a Geoprobe soil sampler to a depth of 12-ft or refusal, whichever occurred first. The exterior boring was drilled with the use of a truck-mounted drill rig to a depth of 30-ft.

Task 2 – Test Pit Excavations RKCI and its sub-contractor performed four test pit excavations to assess the condition of the below grade foundation and record the depth, dimensions (for spread footings only), and condition of the exterior grade beams and footings at these select excavation locations. To perform the test pits, sections of the existing concrete slab and wood-framed sub-floor system were removed at the respective test pit location. Upon completion of the test pit observations, the excavations were backfilled with the excavated soils and the floor slabs were patched with ready-mix concrete. Furthermore, the demolished wood framed subfloor and joists were replaced with spliced sections of wood joists and plywood sheets for subfloor decking. In addition, the in-place compressive strength of the concrete grade beams were estimated with the use of a Schmidt rebound hammer. The excavations were done with the use of a mini-excavator and/or hand tools.

Task 3 – Concrete Coring and Reinforcing Steel Detection RKCI and its subcontractor obtained three, 3-inch diameter concrete cores where the interior borings were performed. The cores were transported to our laboratory and tested for compressive strength testing. While the borings were being performed, RKCI used a Profometer 5 reinforcing steel detection meter to determine the approximate location/orientation of reinforcing steel, its approximate size, and depth. This was performed at select wall locations within the basement, on the floor slab, and where the borings were performed.

Task 4 – Acoustic Concrete Testing The depth of select concrete beams, floor slabs, and the basement wall thickness were measured with an Acoustic Concrete Tester (ACT) manufactured by Pile Dynamics, Inc. This equipment measures the thickness of concrete using pulse Ultrasonic Echo Technology.

Task 5 – Laboratory Testing Upon completion of the field work, the retrieved soil samples were sealed, packaged, and transported to our laboratory for soil analysis. The testing program included moisture content determinations, Atterberg Limits, unit dry weights, unconfined compressive strength tests, and percent passing a No. 200 sieve tests. Laboratory testing was performed in general accordance with applicable ASTM standards.

LIMITATIONS AND ASSUMPTIONS

The information provided in this document is directed to the Client, Center City Development Office, and may not contain information for others and/or for other uses. Some of our observations may be limited due to furnishings, wall, ceiling, and floor finishes. If information described in this document, provided by others, is incorrect or if additional information becomes available, RKCI may need to revise this document.

DOCUMENT REVIEW

During the course of our assessment, the Client provided RKCI with the following documents for review:

- A copy of the Structural Assessment report prepared by Alpha Consulting Engineers, Inc. dated December 10, 2012.

FIELD STUDY

TEST PIT OBSERVATIONS

Test Pits were performed by Geotest Services, Inc., under the direction of RKCI, at three interior and one exterior location. Visual observations of the four test pits, denoted at TP-1 through TP-4, were performed on January 29 and 30, 2014 to assess the construction of buried foundation components. The location of each test pit is shown on the Boring and Test Pit Location Map, Figure 1 of Attachment A. Photographs of our observations are provided in Attachment B. In addition, plan view details of the test pits, along with a representative photograph, are provided in Attachment C of this report for clarity. The following conditions were observed at each test pit location.

Test Pit TP-1 – West Wall of 1432 E. Commerce

Test Pit TP-1 was excavated adjacent to the west wall of Suite 1432 to a depth of approximately 63-inches as shown in Photograph 1. Within this excavation, we observed foundation conditions that indicate Suites 1432 and 1434 have independent foundation systems.

Suite 1434

- As observed from TP-1, the east wall of Suite 1434 is comprised of CMU block units that are supported on a 2-ft deep continuous concrete grade beam as shown in Photographs 1, 2, and 3. Each block is 20-inches long by 8-inches wide by 8 inches tall.

Suite 1432

- At the southwest corner of TP-1, a 4-1/2 ft tall cedar post was encountered beneath the wood-framed wall of Suite 1432 as shown in Photograph 4.
- The cedar post is in poor condition due to rot decay. Large voids, approximately 4 inches in long and 2 inches wide, were encountered within the post as shown in Photograph 5.
- There is a cast in-place concrete footing located beneath the post; however, the post is no longer in contact with the top of the footing as shown in Photograph 6. An approximately 2-inch gap was measured between the bottom of the post and the top of the footing.
- The beam and sill plate of the wood framed wall was found to be in poor condition with indications of rot and possible termite damage as shown in Photographs 7 and 8.

Suite 1432 Floor Slab

- The concrete slab in Suite 1432 is supported on dark brown expansive clay soils as shown in Photograph 9.
- The concrete slab at this location is approximately 4-1/2 inches thick overlain with a 2-1/2 inch mortar bed followed by the Terrazzo floor system.
- The concrete floor slab is reinforced with No.3 deformed bars that are spaced approximately 18-inches on center, each way as shown in Photograph 9.

Base of Archway Column

- A portion of the paneling and trim molding was removed from the 3rd archway from the north wall to determine if the footing could be observed at the base of the column. As shown in Photograph 10, the 2-inch x 4-inch framed column is supported on a cedar post.

Test Pit TP-2 – Suite 1432 Basement

- Wall openings were encountered in the west and north CMU block basement walls as shown in Photograph 11. The west wall opening was not accessible for further observation due to the accumulation of debris in-front of the wall.
- Observations of the north wall opening revealed a void that extends approximately 2 ft north from the north face of the wall as shown in Photographs 12 and 13. A black coating was observed on the outside face of the wall indicating the presence of a moisture barrier.
- A crack was observed extending up through the bond beam above the CMU block wall as shown in Photograph 13. The crack is approximately 1/16-inch wide.
- Unfilled cells were encountered in the block as shown in Photograph 14.
- A 1-1/2 inch diameter cast iron pipe was observed beneath the floor slab of Suite 1432 approximately 2 ft north of the north basement wall. The type of utility that this pipe served could not be determined.
- The test pit was dug at the northeast corner of the basement to a depth of approximately 31-inches deep as shown in Photograph 16.
- The slab is approximately 7-inches thick at this location as shown in Photograph 17.
- A black coating was observed beneath the slab indicating the presence of a possible moisture barrier as shown in Photograph 18.
- The basement floor slab is reinforced with No. 4 bars spaced approximately 2-ft on-center, each way as shown in Photograph 19.
- A gravel seam was encountered beneath the floor slab as shown in Photograph 20. The gravel seam varied in thickness from 8-inches to 1-ft within the test pit, but was not encountered in Boring B-1.
- Basement wall grade beam extends approximately 7-inches below the bottom of the floor slab and was measured to be approximately 1-ft thick.

Test Pit TP-3 and West Wall of Suite 1434

- Within Suite 1434, 4-inch x 6-inch wood posts were observed anchored to the exterior masonry wall with thru-bolts and nuts as shown in Photographs 21 and 22. The wood posts support a double, 2-inch x 12-inch rim joist as shown in Photograph 22.
- A horizontal tie rod was observed approximately 12 ft above the floor surface extending north-to-south along the inside face of the wall.
- Vertical cracks were observed in the CMU block wall varying up to about 3/8-inch in width as shown in Photograph 21.
- Anchor plates were observed on the exterior of the west wall as shown in Photograph 23.
- Test Pit TP-3 was dug to a depth of approximately 4-feet as shown in Photograph 24.
- The 4-inch by 6-inch wood posts are supported on 1-ft x 1-ft x 1ft concrete pedestal footings that were cast in-place on a single course of 8-inch x 8-inch x 16-inch CMU block. The block course is supported by a 2-ft deep concrete grade beam.
- 2-inch x 6-inch wood sleepers are also supported on CMU block course. The sleepers support the ends of the 2-inch x 10-inch floor joists as shown in Photographs 24 and 25.

- The CMU block units are cracked and have signs of efflorescence as shown in Photograph 26.
- The wood floor is suspended on 2-inch x 10-inch cedar joists that are spaced approximately 16-inches on-center and extend from east-to-west with wood cross bracing as shown in Photograph 27. The cross bracing is spaced approximately 10 ft apart. The floor joists in this location were found to be in good condition.
- The floor joists are supported on 2-inch x 6-inch wood sleepers that are supported on CMU block units that have been buried in the ground in a north-to-south orientation as shown in Photograph 28. The sleeper shown in Photograph 28 has a longitudinal crack.
- One of the wood sleepers that supports a floor joists was observed deflecting down toward the north as shown in Photograph 29. This appears to be a result of differential movement.

Test Pit TP-4 – Near Southeast Corner of Suite 1432

- The test pit was dug to a depth of approximately 65-inches.
- There are two approximately 4 ft tall cedar posts that are supported by 2-feet wide by 2-feet long by 18-inch tall concrete block footings as shown in Photograph 30. It appears that the posts were cast in the concrete footings. The cedar posts varied in thickness from about 4-1/2 inches to 6-1/2 inches.
- The concrete floor slab is approximately 4-1/2 inches thick at this location with a 2-1/2 inch layer of mortar on top for the terrazzo tile as shown in Photograph 31.
- The cedar posts originally supported the exterior, wood-framed wall as shown in Photograph 32; however, decay and rot of both the posts and the wood sill has resulted in the members no longer being in attached to one another as shown in Photographs 32 and 33.
- A gap was observed at the base of the cedar post located at the northwest corner of the test pit and the top of the concrete block footing as shown in Photograph 34.

FIELD BORINGS AND LABORATORY TESTS

Subsurface conditions beneath the Sterling Building were evaluated by four borings, designated as B-1 through B-4 as shown on the Boring and Test Pit Location Map, Figure 1 of Attachment A. The borings were performed on January 29 and 30, 2014. The boring locations are approximate and were located in the field. Borings B-1 through B-3 were performed inside the building with a track-mounted, Geoprobe drilling rig. Interior borings were advanced to depths of approximately 12 feet below the existing slab elevation. Boring B-4 was drilled in the grassy area on the east side of the building with a truck-mounted drilling rig and was advanced to a depth of approximately 30 feet below the existing grade.

Upon completion of the drilling operations B-1 through B-3 were backfilled with a bentonite and cement mix up to the top of the slab elevation. The core holes were patched with ready-mix concrete. Boring B-4 was backfilled with auger cuttings generated from the drilling process.

During the exploration activities, the following samples were collected:

TABLE 1 - COLLECTED SOIL SAMPLES

Sample Type	Number Collected
Shelby Tube	34
Split Spoon	6

The samples were sealed in containers to reduce moisture loss, labeled, packaged, and transported to our laboratory for subsequent testing and classification.

In the laboratory, each sample was evaluated and visually classified by a member of our Geotechnical Engineering staff in general accordance with the Unified Soil Classification System (USCS). The geotechnical engineering properties of the samples were evaluated by the laboratory tests tabulated in the Table 2.

TABLE 2 – LABORATORY TEST INFORMATION

Test Type	Number Conducted
Natural Moisture Content	40
Pocket Penetrometer	16
Dry Unit Weight	8
Unconfined Compressive Strength	7
Atterberg Limits	6
No. 200 Sieve	2

The results of the field and laboratory tests are presented in graphical or numerical form on the boring logs illustrated on Figures 2 through 5 of Attachment A. A key to the classification of terms and symbols used on the logs is presented on Figure 6a through 6c. The results of the laboratory and field testing are also tabulated on Figure 7a through 7c for ease of reference.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the written request of the Client.

GEOLOGY

A review of the *Geologic Atlas of Texas, San Antonio Sheet*, indicates that this site is naturally underlain by Uvalde Gravel which can consist of clays, silts, and gravels including cobbles, chert, boulders, and caliche-cemented gravel. The Uvalde Gravels can be highly variable and can therefore result in highly variable conditions over relatively short distances. Key geotechnical engineering concerns for development supported on the Uvalde Gravels are the expansive nature of the clays, the consistency and/or relative density of the deposits, the absence/presence as well as thickness of potentially water-bearing gravels, and the absence/presence of cobbles, boulders and/or cemented materials.

STRATIGRAPHY

The subsurface stratigraphy at this site can be described by three generalized strata. Each stratum has been designated by grouping soils that possess similar physical and engineering characteristics. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual.

Boring B-1 was performed in the partial basement of Suite 1432 while Borings B-2 and B-3 were performed at the slab level within Suite 1432. Boring B-4 was performed in the grassy area near the southeast corner of Suite 1432. Concrete core specimens from Boring B-1 through B-3 were removed with mechanical coring equipment at each boring location to provide access to perform the soil borings. The concrete cores were measured to have a thickness of approximately 6-1/2 inches. Vapor barriers were not encountered beneath the slab at Borings B-2 and B-3; however, in Boring B-1 a black coating was encountered beneath the floor slab that may be the remains of a bitumen-like vapor barrier/waterproofing membrane.

Stratum I consists of fill materials comprised of dark brown clays with gravel and traces of concrete. This stratum was encountered in Borings B-2 and B-3 from beneath the floor slab down to a depth of about 7-ft and 6-ft, respectively. Possible hydrocarbon odors were encountered in this stratum at depths ranging from about 5-1/2 ft to 7 ft. Moisture contents were measured to range between 10 to 36 percent in this layer. This stratum is classified as highly plastic with two measured plasticity indices of 54 and 59 percent. Dry unit weights were measured to range from 84 to 90 pcf. The undrained shear strength was measured to range from 0.48 to 0.54 tsf based on three unconfined compressive strength tests. A single shear strength value of 1.08 tsf was measured based on a pocket penetration test. The measured percent fines passing a No. 200 sieve was 76 percent. These fine grained soils are classified as CH soils in general accordance with the USCS.

Stratum II was encountered in Boring B-4 and consists of very stiff to hard, dark brown clays with trace gravel and red ferrous stains. This layer was encountered from the ground surface elevation existing at the time of our study down to a depth of approximately 5 ft. Moisture contents were measured to be about 29 percent for this layer. This stratum is classified as highly plastic, with a single measured plasticity index of 74 percent. A single dry unit weight was measured to be about 95 pcf. Shear strength values of 1.88 to 2.25 tsf were measured based on two pocket penetration tests. These fine grained soils are classified as CH soils in general accordance with the USCS.

Stratum III consists of firm to hard, tan to light tan gravelly clays and clays and with gravel, chert, calcareous nodules, and red ferrous stains. This layer was encountered in Boring B-1 from beneath the basement slab down to at least the 12-ft termination depth of the boring. In Borings B-2 and B-3, this stratum was encountered from beneath the Stratum I soils down to at least the termination depths of these borings. In Boring B-4, this layer was encountered from beneath the Stratum II soils down to a depth of about 10 ft. Measured moisture contents ranged from about 7 to 37 percent. This stratum is classified as highly plastic, with two measured plasticity indices of 52 and 72 percent. The undrained shear strength was measured to range from 0.45 to 0.94 tsf based on unconfined compressive strength tests. Dry unit weights were measured to range from about 98 to 103 pcf. Shear strength values ranging from 0.50 to 1.75 tsf were measured based on pocket penetration tests. A single percent passing a No.

200 sieve was measured to be 58 percent. Standard Penetration Test (SPT) N-values range from 12 to more than 50 blows per foot of penetration. These fine grained soils are classified as CH soils in general accordance with the USCS.

Stratum IV consists of very stiff to hard, tan and gray clays with red ferrous stains. This stratum was encountered only in Boring B-4 from beneath the Stratum III soils down to at least the 30 ft termination depth of this boring. Measured moisture contents ranged from about 33 to 37 percent. This stratum is classified as highly plastic, with a single measured plasticity index of 68 percent. Blow counts ranging from 18 to 31 blows per foot of penetration were measured for this layer. These fine grained soils are classified as CH soils in general accordance with the USCS.

GROUNDWATER

Groundwater was not encountered either during or immediately upon completion of our drilling operations. However, perched water was observed entering the basement test pit excavation TP-2 once the floor slab was chipped out from the test pit area exposing a water-bearing gravel seam. It is possible for groundwater to exist beneath this site at shallower depths on a transient basis following periods of precipitation. Fluctuations in groundwater levels occur due to variations in rainfall and surface water run-off.

CONCRETE COMPRESSIVE STRENGTH TESTING

A Schmidt rebound hammer was used to estimate the in-place compressive strength of the concrete at the basement floor slab of Suite 1432 and at two locations along the north concrete grade beam of Suite 1434. In general, the in-place compressive strength was measured to be greater than 4,500 psi.

In addition to the Schmidt rebound hammer, the concrete cores obtained from the interior soil borings were tested in our laboratory for compressive strength. These cores were air cured in a temperature and humidity-controlled environment in our laboratory for a minimum of 5 days prior to testing. The cores were tested on February 12, 2014 for compressive strength determination following sawing to test length and capping using a high strength capping compound. The tested cores will be retained in our laboratory for 30 days after the date tested and then discarded unless we receive other instructions from the CLIENT. The direction of the application of the load on each core specimen is perpendicular with respect to the horizontal plane of the concrete as placed. The compressive strength test results are presented in Table 4 on the following page.

TABLE 4 - COMPRESSIVE STRENGTH TESTING

Core Mark	Cored Length (in.)	Capped Length (in)	L/D	Load Applied (pounds)	Compressive Strength (psi)	Correction Factor	Corrected Compressive Strength (psi)
B-1	6.25	6.25	1.66	71,410	5,010	0.928	4,870
B-2	6.5	6.25	1.72	79,610	4,490	0.980	4,400
B-3	6.0	6.0	1.59	82,170	4,670	0.967	4,510
					Average Corrected Compressive Strength		**4,593**

A comparison of the results from both the destructive and non-destructive test methods indicates that similar results were achieved by both test methods.

REINFORCING STEEL DETECTION

Reinforcing steel detection with the use of a Profometer scanning unit of representative sample areas was performed on the interior floor slab and basement floor slab of Suite 1432. Within the ground floor slab, the reinforcing steel was generally spaced approximately 18 inches to 20 inches on-center, each way. This was visually confirmed in Test Pit TP-1 where portions of the reinforcing steel were exposed in the slab opening revealing that the steel was generally within the bottom 1-inch of the concrete. The bar size was measured to be approximately 1/2-inch, corresponding to a No. 4 bar.

Locating reinforcing steel in the concrete grade beams exposed in Test Pits TP-1, TP-2, and TP-3 could not be performed due to irregular surface finishes. Furthermore, scanning of the basement walls did not reveal any indication of the presence of vertical reinforcing steel within these walls. An attempt was made to scan what appeared to be a concrete bond beam at the top of the wall; however, the results highly variable with inconsistent indications of the presence of reinforcing steel.

ACCOUSTIC CONCRETE TESTING

With the use of an Acoustic Concrete Tester (ACT), manufactured by Pile Dynamics, Inc., RKCI was able to measure the depth of certain concrete grade beams, basement floor slab, and thickness of basement walls within Suite 1432. The ACT determines the thickness of concrete elements using ultrasonic echo technology. At each test location, a transmitter and receiver is placed in contact with the finished concrete surface and an ultrasonic pulse is sent through the concrete. The receiver measures the concrete wave speed of the corresponding concrete structure tested and based on the period of time it takes the signal to travel through the concrete its thickness is measured. The measurements of the selected beam depths, and slab and wall thicknesses are provided in Table 5 on the following page. In addition, please refer to Attachment D, Figures D1 to D7 for graphical results of the ACT testing.

TABLE 5 - ACOUSTICAL CONCRETE TESTING

Test No.	ID	Location	Depth (in.)
ACT-1	A	Suite 1434 North Concrete Grade Beam at Blocked Door	26-3/4
ACT-2	B	Suite 1434 North Concrete Grade Beam Functioning Door	30
ACT-3	C Basement Slab	Basement Slab Near Northeast Corner	5-1/2
ACT-4	D East Wall	East Basement Wall	6
ACT-5	E South Wall	South Basement Wall	7-1/2
ACT-6	F North Wall	North Basement Wall	8
ACT-7	Restroom Entrance	Suite 1434 South Concrete Grade Beam at Restroom Addition	32

SOILS INFORMATION

CHARACTERISTICS OF EXPANSIVE SOILS

The clay soils encountered in the borings are considered to be expansive to highly expansive soils. Expansive soils are clay soils that exhibit volume changes with changes in soil water content. Expansive soils shrink or reduce their volume when they lose water (damp to dry) and swell or increase their volume when they gain water (moist to wet).

Expansive soils are often identified by the Atterberg Limits laboratory test. The Atterberg Limits test provides two soil parameters, Liquid Limit and Plastic Limit. The Liquid Limit is the water content of the soil mass at which clay begins to act as a viscous liquid. The Plastic Limit is the water content of the soil mass at which a clay soil begins to break apart and loses its ability to deform without breaking into pieces. The numerical difference between the Liquid Limit and Plastic Limit is known as the Plasticity Index. Generally, the shrink/swell potential of a clay soil increases as the Plasticity Index increases. Therefore, clay soils with relatively large Plasticity Indices generally exhibit greater shrink/swell behavior than clay soils with relatively small Plasticity Indices.

Since the shrinking and swelling behavior of the clay soils depends on changes in soil moisture, satisfactory long-term performance of a foundation is affected by conditions that can affect soil water content. Such conditions may include climate, vegetation, plumbing leaks, irrigation, and site drainage. Semi-arid climates (climates where periods of rainfall are followed by extended periods without rainfall) are more susceptible to shrink/swell behavior than climates that tend to remain either wet or dry.

In addition, the type and extent of vegetation affects the water content of the soil since some types of trees, shrubs, and grasses require more moisture than others. The extent to which the vegetation is watered (or not watered) also directly affects soil moisture conditions, as do the surface drainage conditions around a foundation.

EXPANSIVE SOIL-RELATED MOVEMENTS

The anticipated ground movements due to swelling of the underlying soils encountered in our borings were estimated using both the results of the Texas Department of Transportation (TxDOT) procedures (Tex-124-E) for determining the Potential Vertical Rise (PVR). The TxDOT method of estimating expansive soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. Total PVR values ranging from 6-3/4 to 7-3/4 inches were estimated utilizing the Tex-124-E procedure. In estimating these values, an active zone of 15 ft and a dry moisture condition was assumed.

The TxDOT method of estimating expansive soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. If desired, other methods of estimating expansive soil-related movements are available, such as estimations based on swell tests and/or soil-suction analyses. However, the performance of these tests and the detailed analysis of expansive soil-related movements were beyond the scope of the current study. It should also be noted that actual movements can exceed the calculated PVR values due to isolated changes in moisture content (such as due to leaks, landscape watering....) or if water seeps into the soils to greater depths than the assumed active zone depth due to deep trenching or excavations.

PVR reduction options such as chemical treatment or drilled piers can be implemented to reduce the expansive soil-related movements. Once the Client has developed a schematic design for the planned redevelopment, we recommend that RKCI be consulted to assist in developing PVR reduction options for the Client to consider.

OPINIONS

On the basis of our field and laboratory studies, our understanding of how these structures were constructed, and our previous experience with similar projects, we provide the following opinions:

Suite 1432

- The cedar posts supporting the load bearing walls and archway columns exhibit severe decay and are no longer capable of properly supporting these structures. We believe these portions of the structure cannot be repaired economically and may need to be retrofitted or demolished.
- The shallow spread footings supporting the cedar posts are within the active zone and are susceptible to shrink/swell movements of the clay soils.
- The gravel layer encountered beneath the basement floor slab is water bearing. Groundwater conditions can fluctuate with seasonal moisture changes.
- The basement wall openings are pathways for transient water to move beneath the ground level floor slab into the basement.
- The utility lines may also be contributing to the water infiltration conditions within the basement. Further study is warranted to determine the condition of these lines given their proximity to the basement.
- The basement and 1st floor slab were generally in good condition and exhibit decent compressive strength characteristics given their age.
- The concrete beam, floor slab, and basement construction should be analyzed by Alpha Consulting Engineers to determine if it can be re-used as part of any future development.

Suite 1434

- The exterior grade beams were generally found to be in good condition with no significant indications of deterioration where they were exposed.
- The west side CMU block wall has experienced significant cracking and separations. Given the 4-inch x 6-inch wood post supports and tie rods used to provide lateral stability to these walls, we suspect that they may not be reinforced. These walls should be analyzed by Alpha Consulting Engineers to determine their adequacy.
- The wood sleepers, supported on the CMU blocks, beneath the wood subfloor are exhibiting some signs of differential movement.
- Differential movements will likely continue over the life of the structure.

ALLOWABLE BEARING CAPACITY

New and existing shallow, concrete foundations founded on native undisturbed soil may be proportioned using the design parameters in Table 3 below.

TABLE 3 – ALLOWABLE BEARING CAPACITY

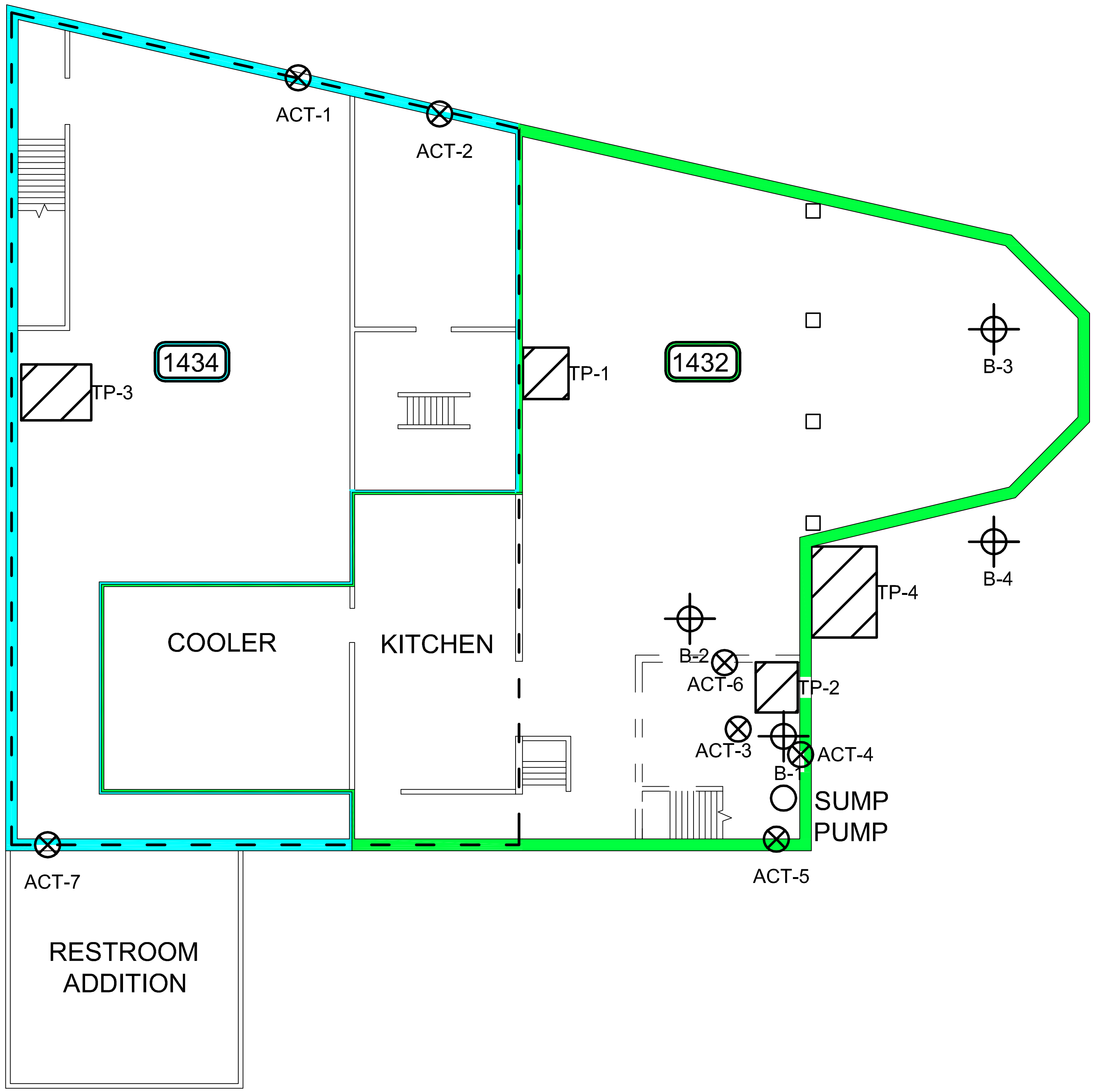
Minimum depth below final grade	30 in.
Minimum beam width	12 in.
Maximum allowable bearing pressure for grade beams	2,000 psf
Maximum allowable bearing pressure for widened beams	2,300 psf

The above presented maximum allowable bearing pressures will provide a factor of safety of about 3 with respect to the measured shear strength. We estimate total settlement to be on the order of 1 inch.

For new floor slabs, we recommend that a vapor barrier comprised of polyethylene or polyvinylchloride (PVC) sheeting be placed between the supporting soils and the concrete floor slab to mitigate moisture vapor emissions through the concrete.

* * * * * * * * * * * * * * * * * *

ATTACHMENT A



FLOOR PLAN PROVIDED TO RKCI BY CLIENT ON OCT. 16 2013 AND IS BASED ON FLOOR PLAN PREPARED BY ALPHA CONSULTING ENGINEERS DRAWINGS (SHEETS SI, S2, AND S3 DATED DEC. 12, 2012)

1 TEST LOCATIONS
SCALE: 3/32"=1'-0"

PLAN NORTH

LEGEND

Symbol	Description
B-1	BORING LOCATION
TP-1	TEST PIT LOCATION
ACT-1	ACOUSTICAL CONCRETE TESTING
— — —	GRADE BEAM
(cyan)	BOUNDARY OF SUITE 1434
(green)	BOUNDARY OF SUITE 1432
□	ARCHWAY COLUMNS

RABA KISTNER
Raba Kistner Consultants, Inc.
12821 West Golden Lane
San Antonio, Texas 78249
www.rkci.com
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
TBPE Firm F-3257

TEST LOCATIONS

FORENSIC STUDY
STERLING BUILDING
1432-1434 E. COMMERCE STREET
SAN ANTONIO, TEXAS

REVISIONS:

No.	DATE	DESCRIPTION

PROJECT No.:	ASR14-003-00
ISSUE DATE:	3-3-14
DRAWN BY:	LMS
CHECKED BY:	JHA
REVIEWED BY:	JHA

ATTACHMENT A
FIGURE 1

LOG OF BORING NO. B-1

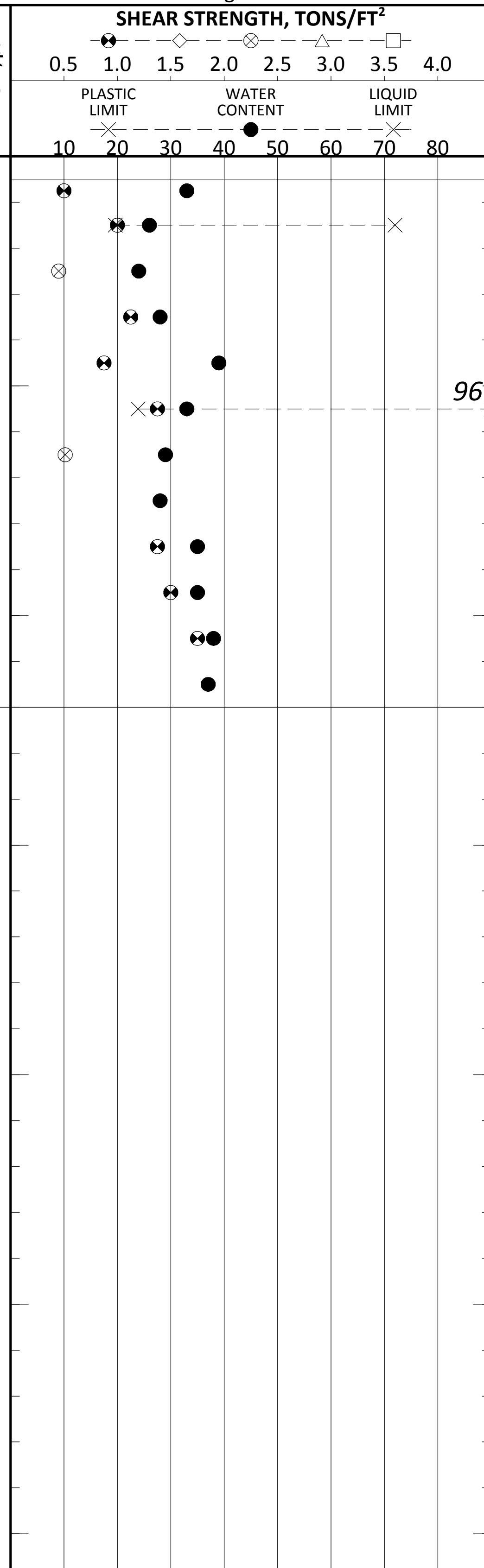
Sterling Building Forensic Study
1432 - 1434 E. Commerce Street
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Geoprobe

LOCATION: See Figure 1

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
0	Portland Cement Concrete, 6-1/2 in. thick, with possible vapor barrier				
	CLAY, Firm to Very Stiff, Tan, with red ferrous stains			52	
			99		
5				72	
			98		
12	Boring Terminated				



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 12.0 ft
DATE DRILLED: 1/29/2014
DEPTH TO WATER: Dry
DATE MEASURED: 1/29/2014
PROJ. No.: ASR14-003-00
FIGURE: 2

LOG OF BORING NO. B-2

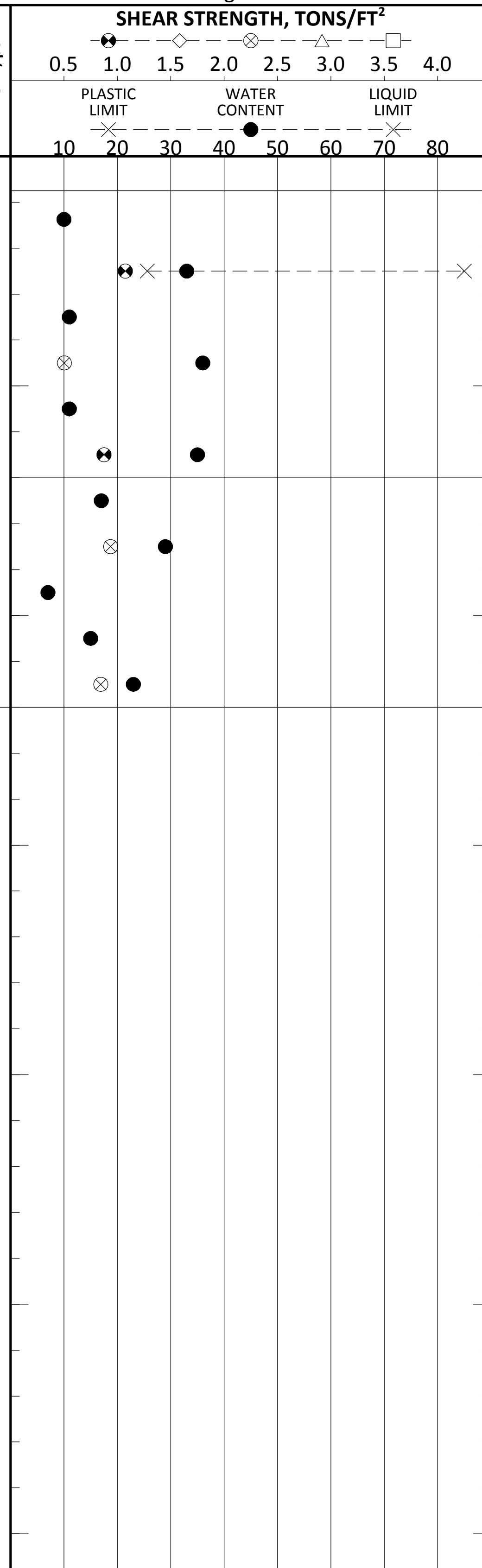
Sterling Building Forensic Study
1432 - 1434 E. Commerce Street
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Geoprobe

LOCATION: See Figure 1

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
0 – 0.5	Portland Cement Concrete, 6-1/2 in. thick with no vapor barrier				
0.5 – 7	POSSIBLE FILL: CLAY, Stiff to Firm, Dark Brown, with gravel - with concrete to 4-ft. - with possible hydrocarbon odors from 6 to 7-ft.		84	59	76
7 – 12	CLAY, Stiff, Light Tan, with calcareous nodules - with chert from 9 to 10-ft.		98 103		
12	Boring Terminated				



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 12.0 ft
DATE DRILLED: 1/30/2014
DEPTH TO WATER: Dry
DATE MEASURED: 1/30/2014
PROJ. No.: ASR14-003-00
FIGURE: 3

LOG OF BORING NO. B-3

Sterling Building Forensic Study
1432 - 1434 E. Commerce Street
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Geoprobe **LOCATION:** See Figure 1

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT² / PLASTIC LIMIT – WATER CONTENT – LIQUID LIMIT	PLASTICITY INDEX	% -200
0–0.5	PCC, 6-1/2 in. thick with no vapor barrier					
0.5–6	POSSIBLE FILL: CLAY, Firm, Dark Brown					
~4			85			
~5	- with possible hydrocarbon odors		90		54	
6–9	CLAY, Tan, with chert and calcareous nodules, with possible hydrocarbon odors					
9	Boring Terminated					

NOTES:
- Drilling stopped due to refusal at 9-ft. 1-in.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 9.1 ft
DATE DRILLED: 1/30/2014
DEPTH TO WATER: Dry
DATE MEASURED: 1/30/2014
PROJ. No.: ASR14-003-00
FIGURE: 4

LOG OF BORING NO. B-4

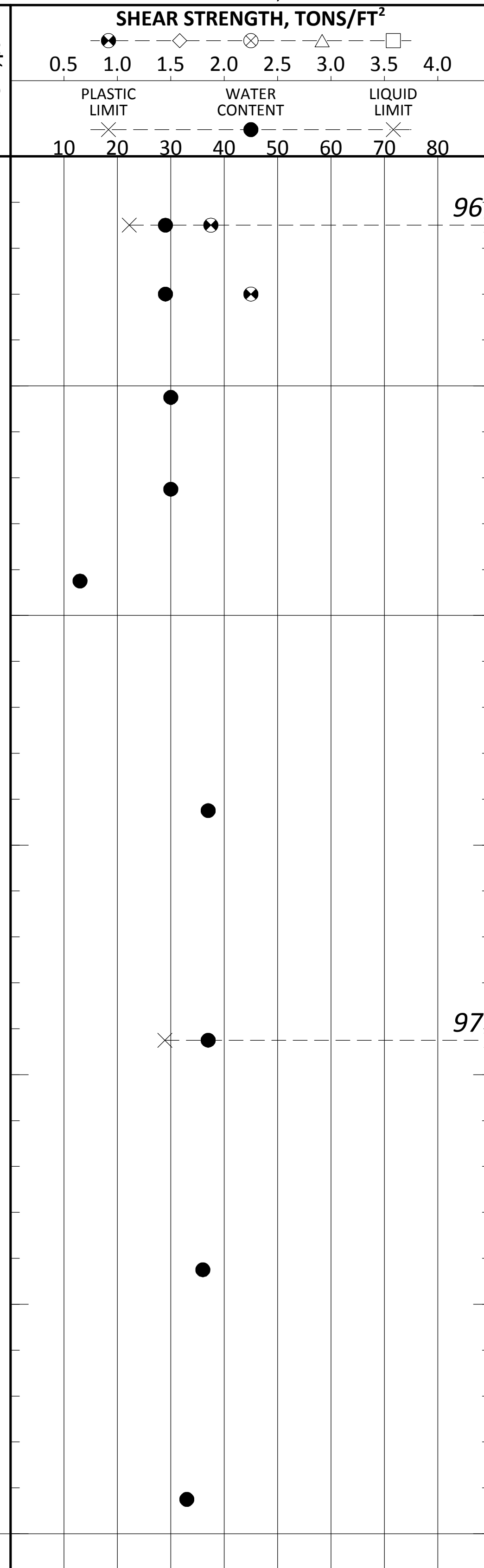
Sterling Building Forensic Study
1432 - 1434 E. Commerce Street
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.42035; E 98.47342

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
0–5	CLAY, Very Stiff to Hard, Dark Brown, with trace gravel - with red ferrous stains from 1 to 2-ft.			74	
			95		
5–10	CLAY, Stiff to Hard, Tan, with gravel	12			
	- with chert below 6-1/2 ft.	37			58
	- very gravelly from 8 to 10-ft.	50/11"			
10–30	CLAY, Very Stiff to Hard, Tan and Gray, with red ferrous stains				
		18			
				68	
		35			
	- with calcareous deposits below 28-ft.	31			
30	Boring Terminated				



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	30.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	ASR14-003-00
DATE DRILLED:	1/31/2014	**DATE MEASURED:**	1/31/2014	**FIGURE:**	5

KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

SOIL TERMS		ROCK TERMS		OTHER
CALCAREOUS	PEAT	CHALK	LIMESTONE	ASPHALT
CALICHE	SAND	CLAYSTONE	MARL	BASE
CLAY	SANDY	CLAY-SHALE	METAMORPHIC	CONCRETE/CEMENT
CLAYEY	SILT	CONGLOMERATE	SANDSTONE	BRICKS / PAVERS
GRAVEL	SILTY	DOLOMITE	SHALE	WASTE
GRAVELLY	FILL	IGNEOUS	SILTSTONE	NO INFORMATION

WELL CONSTRUCTION AND PLUGGING MATERIALS

BLANK PIPE	BENTONITE	BENTONITE & CUTTINGS	CUTTINGS	SAND
SCREEN	CEMENT GROUT	CONCRETE/CEMENT	GRAVEL	VOLCLAY

SAMPLE TYPES

AIR ROTARY	MUD ROTARY	SHELBY TUBE
GRAB SAMPLE	NO RECOVERY	SPLIT BARREL
CORE	NX CORE	SPLIT SPOON
GEOPROBE SAMPLER	PITCHER	TEXAS CONE PENETROMETER
ROTOSONIC -DAMAGED	ROTOSONIC -INTACT	DISTURBED

STRENGTH TEST TYPES

- POCKET PENETROMETER
- TORVANE
- UNCONFINED COMPRESSION
- TRIAXIAL COMPRESSION UNCONSOLIDATED-UNDRAINED
- TRIAXIAL COMPRESSION CONSOLIDATED-UNDRAINED

NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. ASR14-003-00

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
BTEX = Total BTEX
TPH = Total Petroleum Hydrocarbons
ND = Not Detected
NA = Not Analyzed
NR = Not Recorded/No Recovery
OVA = Organic Vapor Analyzer
ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium
Qat = Low Terrace Deposits
Qbc = Beaumont Formation
Qt = Fluviatile Terrace Deposits
Qao = Seymour Formation
Qle = Leona Formation
Q-Tu = Uvalde Gravel
Ewi = Wilcox Formation
Emi = Midway Group
Mc = Catahoula Formation
El = Laredo Formation
Kknm = Navarro Group and Marlbrook Marl
Kpg = Pecan Gap Chalk
Kau = Austin Chalk

Kef = Eagle Ford Shale
Kbu = Buda Limestone
Kdr = Del Rio Clay
Kft = Fort Terrett Member
Kgt = Georgetown Formation
Kep = Person Formation
Kek = Kainer Formation
Kes = Escondido Formation
Kew = Walnut Formation
Kgr = Glen Rose Formation
Kgru = Upper Glen Rose Formation
Kgrl = Lower Glen Rose Formation
Kh = Hensell Sand

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

SAMPLING METHODS

RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-in.-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Sterling Building Forensic Study
1432 - 1434 E. Commerce Street
San Antonio, Texas

FILE NAME: ASR14-003-00 SOIL REPORT.GPJ 3/7/2014

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-1	0.5 to 1.0		33							0.50	PP
	1.0 to 2.0		26	72	20	52	CH			1.00	PP
	2.0 to 3.0		24					99		0.45	UC
	3.0 to 4.0		28							1.13	PP
	4.0 to 5.0		39							0.88	PP
	5.0 to 6.0		33	96	24	72	CH			1.38	PP
	6.0 to 7.0		29					98		0.51	UC
	7.0 to 8.0		28								
	8.0 to 9.0		35							1.38	PP
	9.0 to 10.0		35							1.50	PP
	10.0 to 11.0		38							1.75	PP
	11.0 to 12.0		37								
B-2	0.8 to 2.0		10								
	2.0 to 3.0		33	85	26	59	CH			1.08	PP
	3.0 to 4.0		11								
	4.0 to 5.0		36					84		0.50	UC
	5.0 to 6.0		11						76		
	6.0 to 7.0		35							0.88	PP
	7.0 to 8.0		17								
	8.0 to 9.0		29					98		0.94	UC
	9.0 to 10.0		7								
	10.0 to 11.0		15								
	11.0 to 12.0		23					103		0.84	UC
B-3	0.5 to 3.0										
	3.0 to 4.0		34								
	4.0 to 5.0		34					85		0.54	UC
	5.0 to 6.0		33	76	22	54	CH	90		0.48	UC
	6.0 to 7.0		15							0.75	PP
	7.0 to 8.0		20								
	8.0 to 9.0		11								
	9.0 to 9.1		15								
B-4	1.0 to 2.0		29	96	22	74	CH			1.88	PP
	2.0 to 4.0		29					95		2.25	PP
	4.5 to 6.0	12	30								
	6.5 to 8.0	37	30						58		
	8.5 to 10.0	50/11"	13								
	13.5 to 15.0	18	37								
	18.5 to 20.0		37	97	29	68	CH				
	23.5 to 25.0	35	36								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASR14-003-00

RABAKISTNER

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Sterling Building Forensic Study
1432 - 1434 E. Commerce Street
San Antonio, Texas

FILE NAME: ASR14-003-00 SOIL REPORT.GPJ 3/7/2014

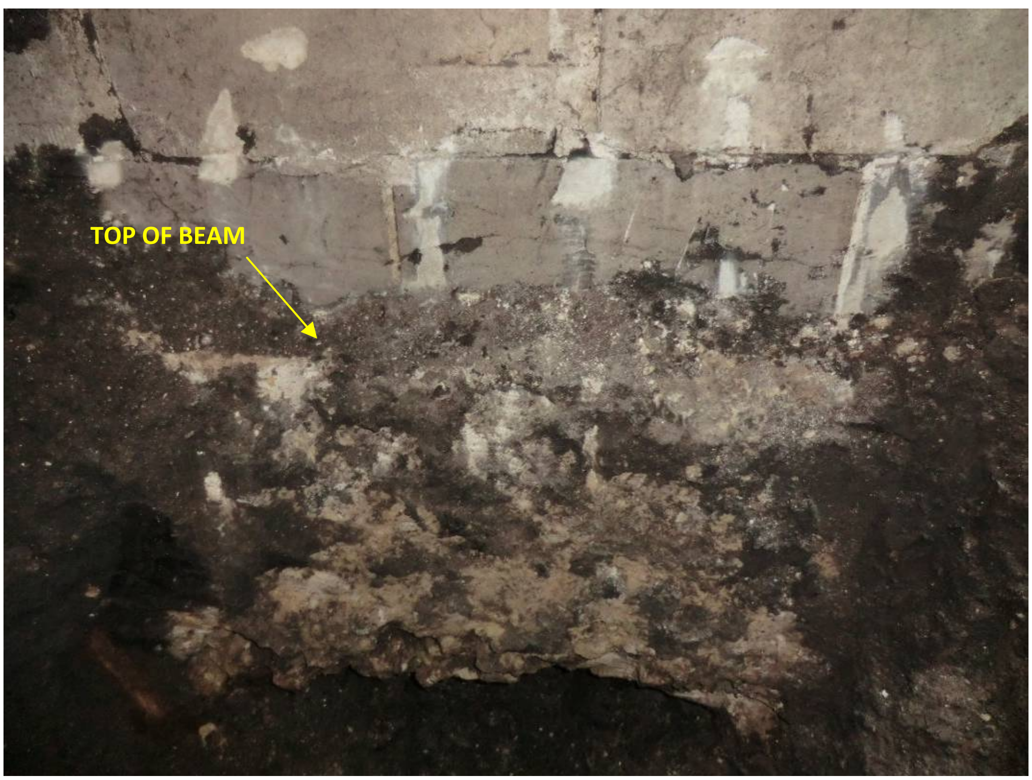
Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-4	28.5 to 30.0	31	33								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

ATTACHMENT B

PHOTOGRAPH 1 - GENERAL VIEW OF TEST PIT TP-1 EXCAVATION WITHIN SUITE 1432.



PHOTOGRAPH 2 – GENERAL VIEW OF CONCRETE GRADE BEAM SUPPORTING CMU BLOCK WALL OF SUITE 1434 AS OBSERVED FROM TP-1.

PHOTOGRAPH 3 – CLOSE-UP VIEW OF 20-INCH LONG CMU BLOCK OBSERVED IN TP-1.


PHOTOGRAPH 4 – GENERAL VIEW OF CEDAR POST AT SOUTHWEST CORNER OF TP-1.

PHOTOGRAPH 5 – GENERAL VIEW OF VOID WITHIN CEDAR POST OBSERVED IN TP-1.

PHOTOGRAPH 6 – CLOSE-UP VIEW OF GAP BETWEEN THE BOTTOM OF THE CEDAR POST AND TOP OF THE CONCRETE FOOTING.

PHOTOGRAPH 7 – CLOSE-UP VIEW OF THE TOP OF THE CEDAR POST BENEATH WOOD BEAM AT BASE OF THE WEST WALL OF SUITE 1432.

PHOTOGRAPH 8 – CLOSE-UP VIEW OF WOOD DECAY AT BASE OF WEST WALL OF SUITE 1432 AS VIEWED WHILE LOOKING UP ALONG BASE OF WALL.

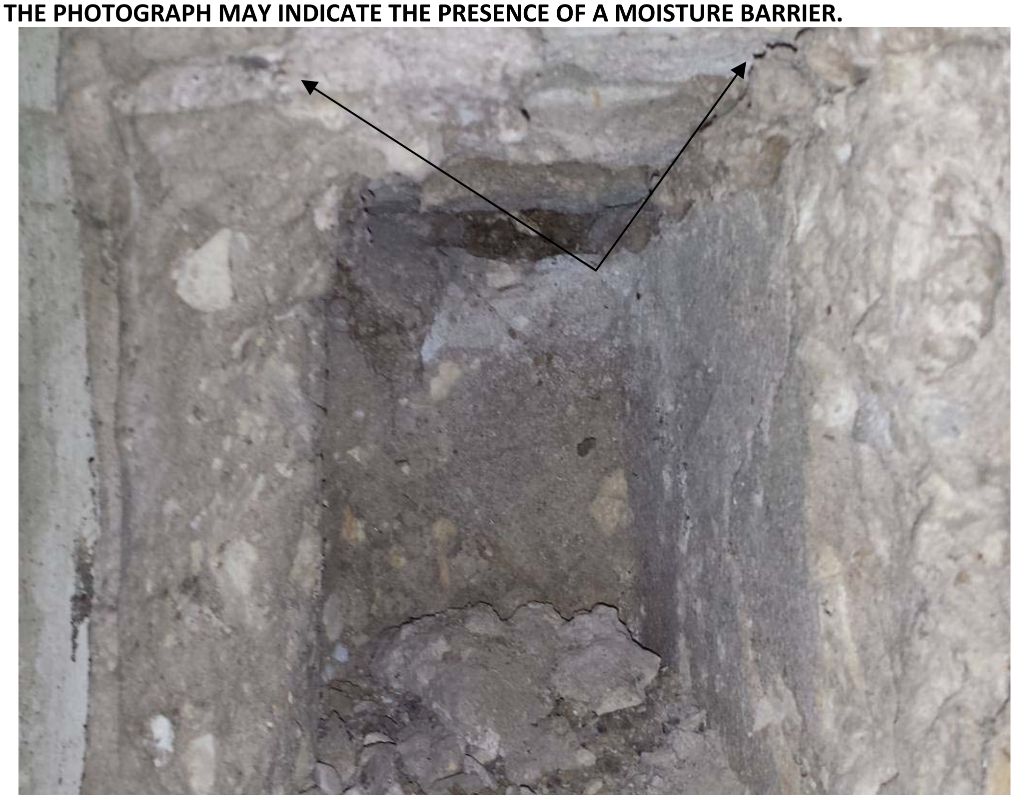
PHOTOGRAPH 9 – CLOSE-UP VIEW OF REINFORCING STEEL LOCATED AT BOTTOM OF FLOOR SLAB IN TP-1. REINFORCING STEEL IS SPACED APPROXIMATELY 18-INCHES ON CENTER, EACH WAY.

PHOTOGRAPH 10 – CLOSE-UP VIEW OF CEDAR POST SUPPORTING 2-INCH X 4-INCH FRAMED ARCH COLUMN IN SUITE 1432.

PHOTOGRAPH 11 – GENERAL VIEW OF PARTIAL BASEMENT WITHIN SUITE 1432 WITH MOISTURE STAINING AND WALL OPENINGS IN THE NORTH AND WEST CMU BLOCK WALLS.

PHOTOGRAPH 12 – CLOSE-UP VIEW OF NORTH WALL OPENING IN CMU BLOCK WALL.

PHOTOGRAPH 13 - CLOSE-UP VIEW OF VERTICAL CRACK IN NORTH WALL OPENING THAT EXTENDS THROUGH CONCRETE BOND BEAM. NOTE, BLACK COATING AT THE FOREFRONT OF THE PHOTOGRAPH MAY INDICATE THE PRESENCE OF A MOISTURE BARRIER.

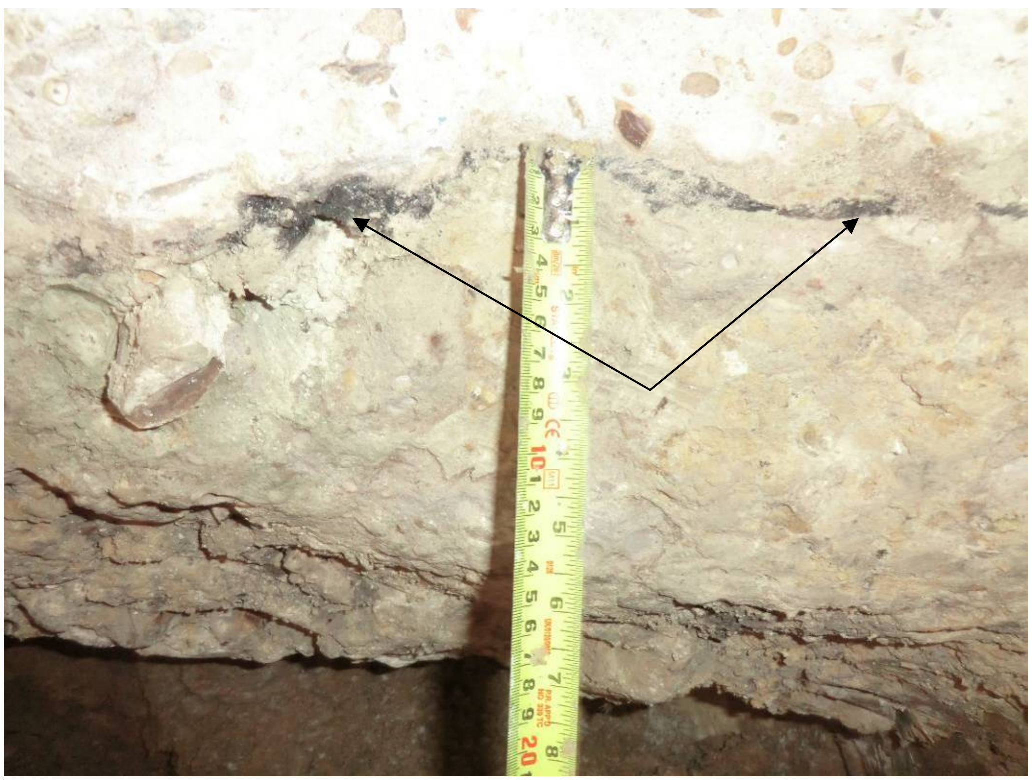


PHOTOGRAPH 14 – GENERAL VIEW OF UNFILLED CELL WITHIN CMU BLOCK AT NORTH WALL OPENING. ARROW INDICATES LOCATION OF BED JOINT BETWEEN COURSES.

PHOTOGRAPH 15 - GENERAL VIEW OF CAST-IRON PIPE OBSERVED BELOW THE FLOOR SLAB AND APPROXIMATELY 2 FT NORTH OF THE NORTH BASEMENT WALL.

PHOTOGRAPH 16 – GENERAL VIEW OF TP-2 AT NORTHEAST CORNER OF BASEMENT.

PHOTOGRAPH 17 – GENERAL VIEW OF BASEMENT SLAB THICKNESS MEASURED TO BE APPROXIMATELY 7-INCHES THICK.

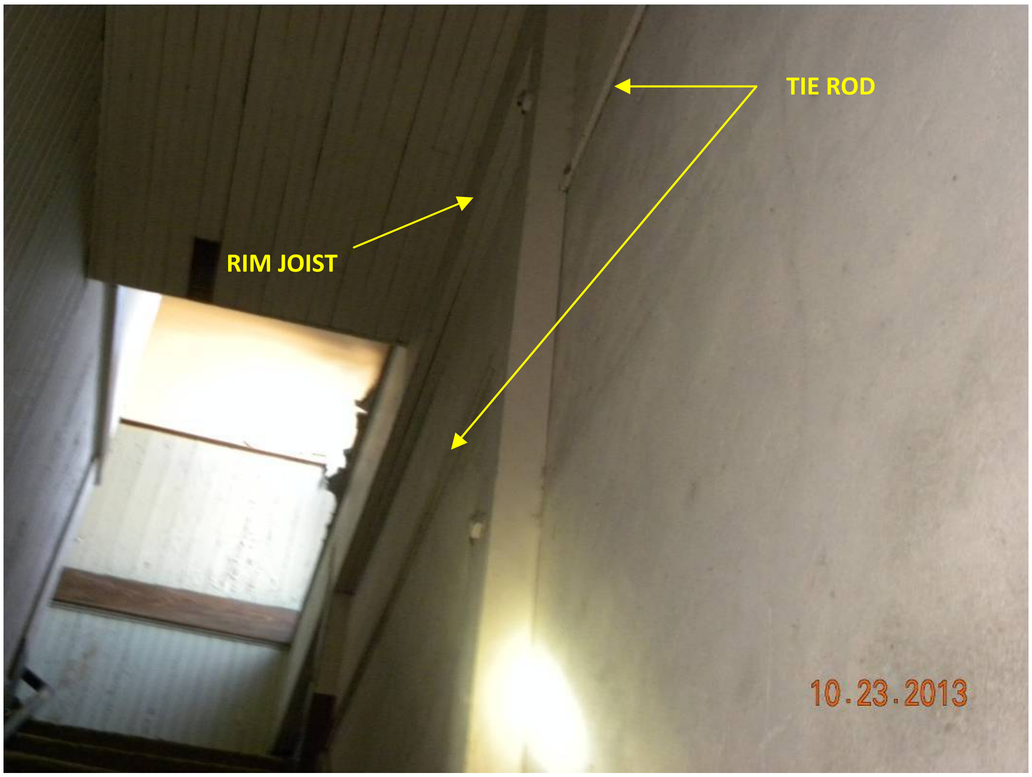


PHOTOGRAPH 18 – CLOSE-UP VIEW OF GRADE BEAM DEPTH BELOW SLAB MEASURING APPROXIMATELY 7-INCHES DEEP. NOTE, BLACK STAINING MAY INDICATE PRESENCE OF A MOISTURE BARRIER.

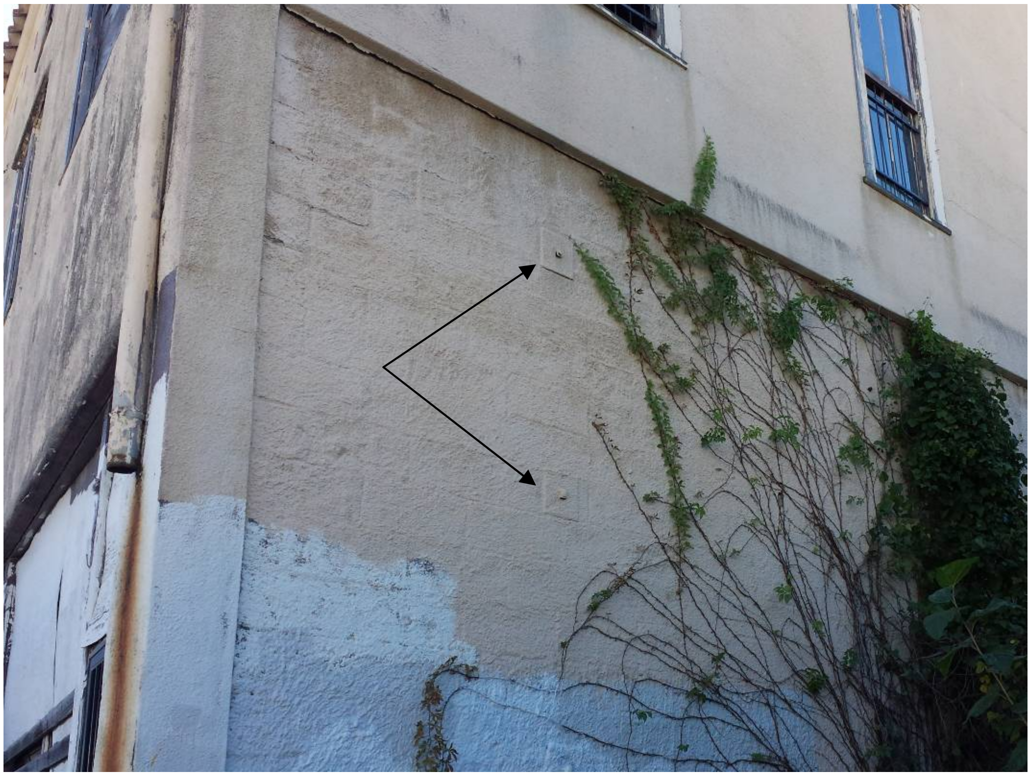
PHOTOGRAPH 19 – CLOSE-UP VIEW OF NO. 4 REINFORCING STEEL SPACED APPROXIMATELY 2-FEET ON CENTER, EACH WAY.

PHOTOGRAPH 20 – CLOSE-UP VIEW OF GRAVEL FILL BENEATH BASEMENT FLOOR SLAB.

PHOTOGRAPH 21 – GENERAL VIEW OF 4-INCH BY 6-INCH WOOD POST ANCHORED TO WEST CMU BLOCK WALL OF SUITE 1434 WITH THRU-BOLT AND NUT.



PHOTOGRAPH 22 – GENERAL VIEW OF 4-INCH BY 6-INCH WOOD POST ANCHORED TO WEST CMU BLOCK WALL IN STAIRCASE. NOTE, THE POST SUPPORTS A RIM JOIST CONSISTING OF TWO, 2-INCH BY 12-INCH MEMBERS. ARROW INDICATES LOCATION OF 1-INCH DIAMETER HORIZONTAL TIE ROD.



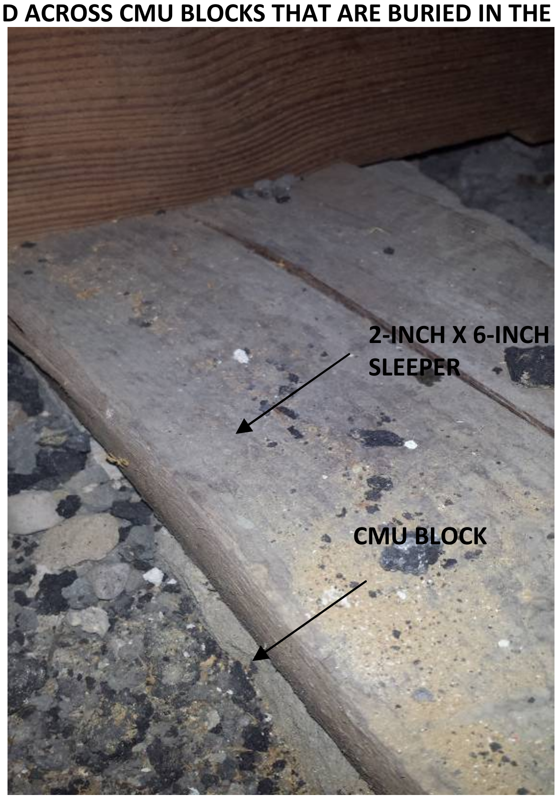
PHOTOGRAPH 23 – GENERAL VIEW OF 8-INCH X 8-INCH ANCHORS PLATES LOCATED ON THE EXTERIOR OF THE WEST WALL OF SUITE 1434. THRU-BOLTS EXTEND THROUGH CMU WALL AND 4-INCH X 6-INCH WOOD POSTS LOCATED ON INSIDE FACE OF WALL.

PHOTOGRAPH 24 – GENERAL VIEW OF TP-3 WITH CONCRETE PEDESTAL FOOTING LOCATED ABOVE A SINGLE CMU BLOCK COURSE THAT IS SUPPORTED ON A CONCRETE GRADE BEAM. THE PEDESTAL SUPPORTS A 4-INCH X 6-INCH WOOD POST.

PHOTOGRAPH 25 – GENERAL VIEW OF FLOOR JOISTS SUPPORTED ON 2-INCH X 6-INCH WOOD SLEEPER LAID ACROSS TOP OF CMU BLOCK COURSE AT WEST GRADE BEAM.

PHOTOGRAPH 26 – CLOSE-UP VIEW OF CRACKED CMU BLOCK SHOWN IN PHOTOGRAPH 24, LOCATED BELOW THE CONCRETE PEDESTAL.

PHOTOGRAPH 27 – GENERAL VIEW OF WOOD SUBFLOOR WITH 2-INCH X 10-INCH FLOOR JOISTS WITH CROSS BRACING. NOTE, THE FLOOR JOISTS ARE RESTING ON 2-INCH x 6-INCH WOOD SLEEPERS LAID ACROSS CMU BLOCKS THAT ARE BURIED IN THE GROUND.



PHOTOGRAPH 28 – CLOSE-UP VIEW OF 2-INCH X 6-INCH WOOD SLEEPER LAID ACROSS CMU BLOCK SUPPORTING THE FLOOR JOISTS THAT SPAN BETWEEN THE EAST AND WEST WALLS OF SUITE 1434. NOTE, THERE IS A 1/8-INCH WIDE CRACK IN THE WOOD SLEEPER.

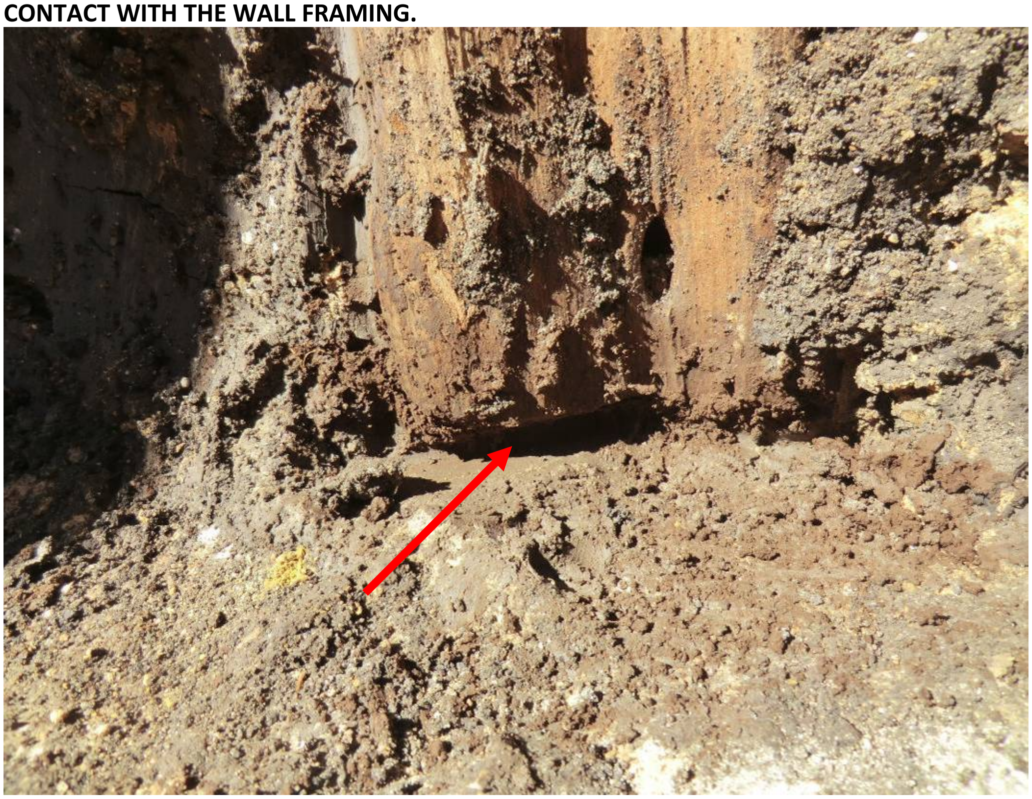
PHOTOGRAPH 29 – CLOSE-UP VIEW OF DOWNWARD DEFLECTING WOOD SLEEPER AT NORTH FLOOR JOIST AS VIEWED FROM TP-3.

PHOTOGRAPH 30 – GENERAL VIEW OF CEDAR POSTS AND CONCRETE FOOTING IN TP-4. POSTS ARE SPACED APPROXIMATELY 4-FT APART.

PHOTOGRAPH 31 – CLOSE-UP VIEW OF CONCRETE SLAB THICKNESS AT TP-4.

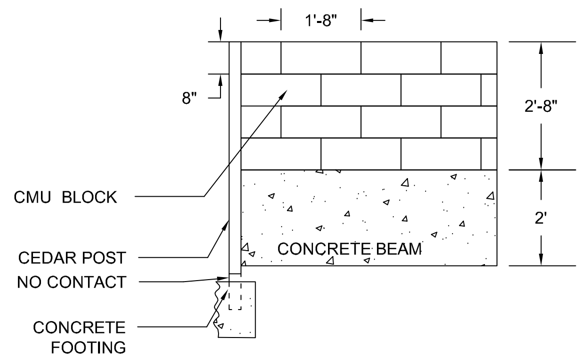
PHOTOGRAPH 32 – GENERAL VIEW OF TOP OF CEDAR POST AT SOUTHWEST CORNER OF TP-4. NOTE, A GAP HAS FORMED BETWEEN THE TOP OF THE POST AND THE WALL FRAMING. VOIDS ENCOUNTERED IN POST WHERE DECAY HAS OCCURRED.

PHOTOGRAPH 33 - GENERAL VIEW OF TOP OF THE CEDAR POST AT THE NORTHWEST CORNER OF TP-4. NOTE, THE TOP OF THE POST HAS DECAYED AND IS NO LONGER IN CONTACT WITH THE WALL FRAMING.

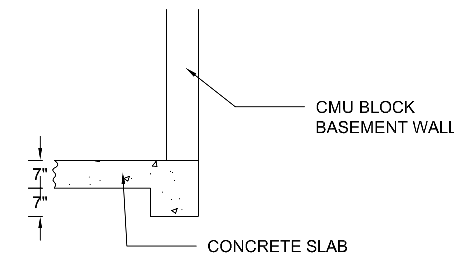


PHOTOGRAPH 34 – CLOSE-UP VIEW OF THE BOTTOM OF THE CEDAR POST AT THE NORTHWEST CORNER OF TP-4. NOTE, A GAP HAS FORMED BETWEEN THE BOTTOM OF THE CEDAR POST AND THE TOP OF THE CONCRETE FOOTING.

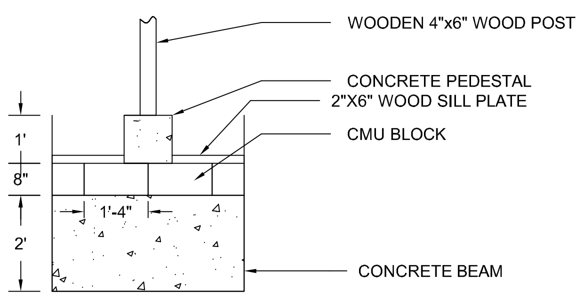
ATTACHMENT C



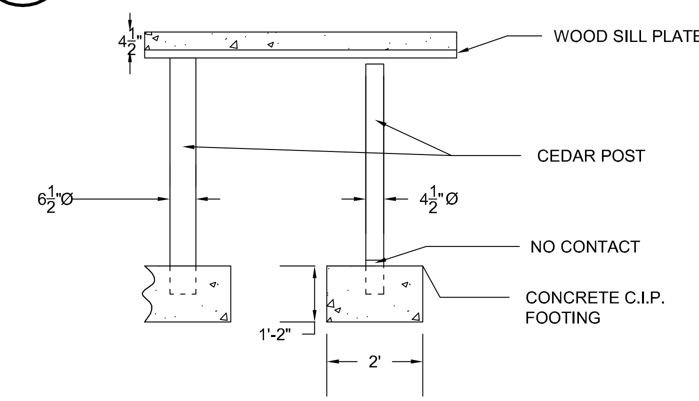
1 TEST PIT TP-1 (1432 E. COMMERCE)
SCALE: 1/4"=1'-0"



1 TEST PIT TP-2 (1432 E. COMMERCE - BASEMENT)
SCALE: 1/4"=1'-0"



1 TEST PIT TP-3 (1434 E. COMMERCE)
SCALE: 1/4"=1'-0"



1 TEST PIT TP-4 (1432 E. COMMERCE - EXTERIOR)
SCALE: 1/4"=1'-0"

RABA KISTNER

Raba Kistner Consultants, Inc.

12821 West Golden Lane
San Antonio, Texas 78249
www.rkci.com
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
TBPE Firm F-3257

TEST PITS TP-1 THROUGH TP-4

FORENSIC STUDY
STERLING BUILDING
1432-1434 E. COMMERCE STREET
SAN ANTONIO, TEXAS

REVISIONS:

No.	DATE	DESCRIPTION

PROJECT No.:	ASR14-003-00
ISSUE DATE:	3-3-14
DRAWN BY:	LMS
CHECKED BY:	JHA
REVIEWED BY:	JHA

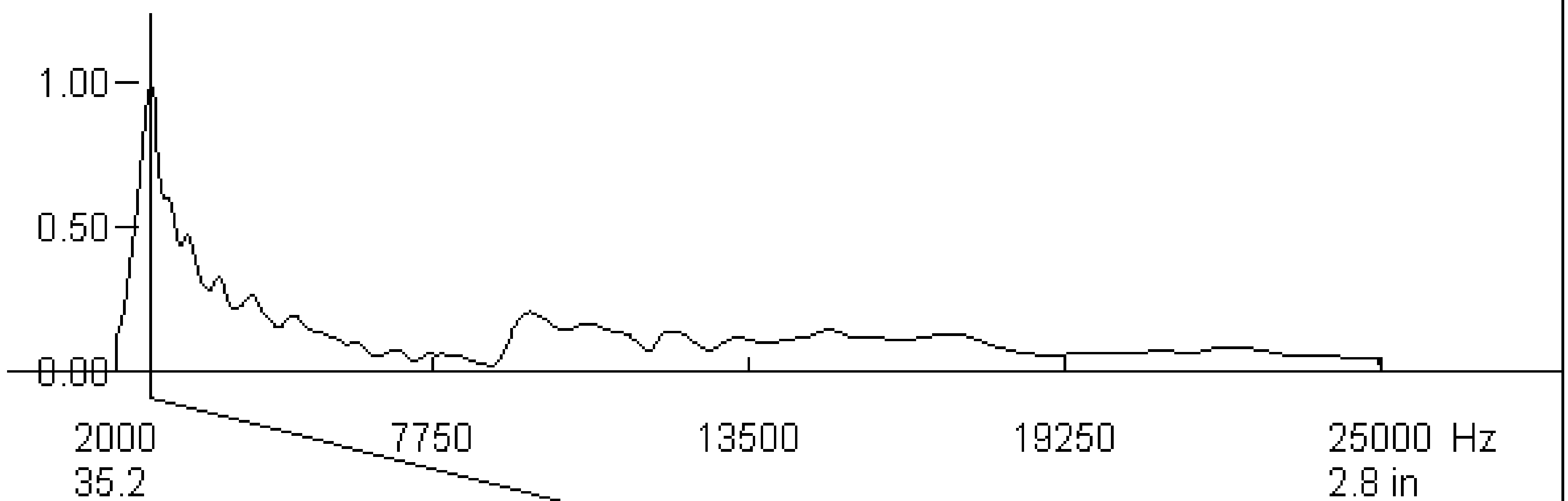
ATTACHMENT C
FIGURE C1

N:\Active Projects\San Antonio – Forensic Services\ASR14-003-00 Sterling Building Forensic Study\Drawings\Test Pits.dwg

ATTACHMENT D

RKCI STERLING

ID: A



WS: 11733 ft/s

03Feb2014 18:37

TH: 26.8 in

FR: 2625 Hz

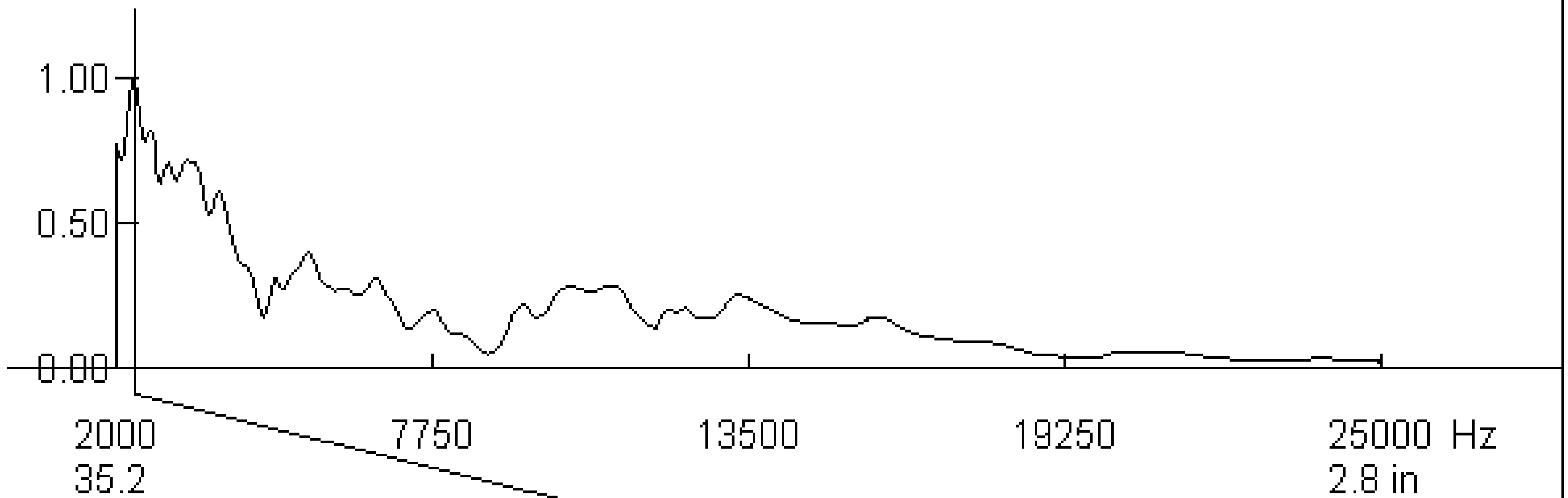
GRL Engineers, Inc.

Pile Dynamics, Inc.

ATTACHMENT D
FIGURE D1

RKCI STERLING

ID: B



WS: 11733 ft/s

03Feb2014 18:46

TH: 30.0 in
FR: 2344 Hz

GRL engineers, inc.

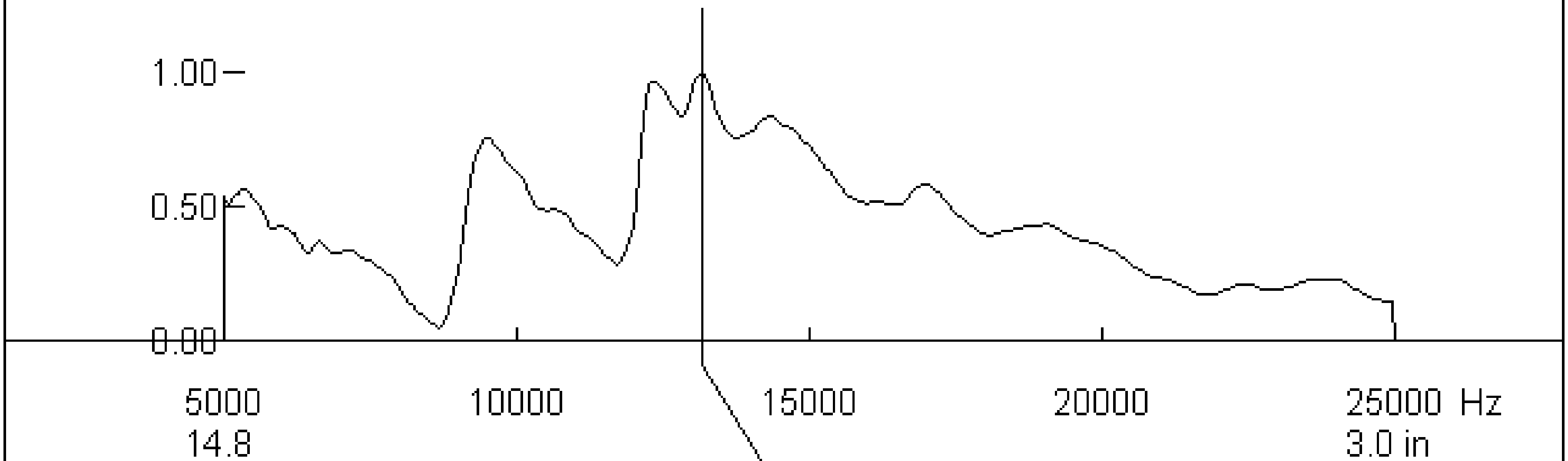
GRL Engineers, Inc.

Pile Dynamics, Inc.

ATTACHMENT D
FIGURE D2

RKCI STERLING

ID: C BASEMENT SLAB



WS: 12308 ft/s

03Feb2014 18:52

TH: 5.6 in
FR: 13172 Hz

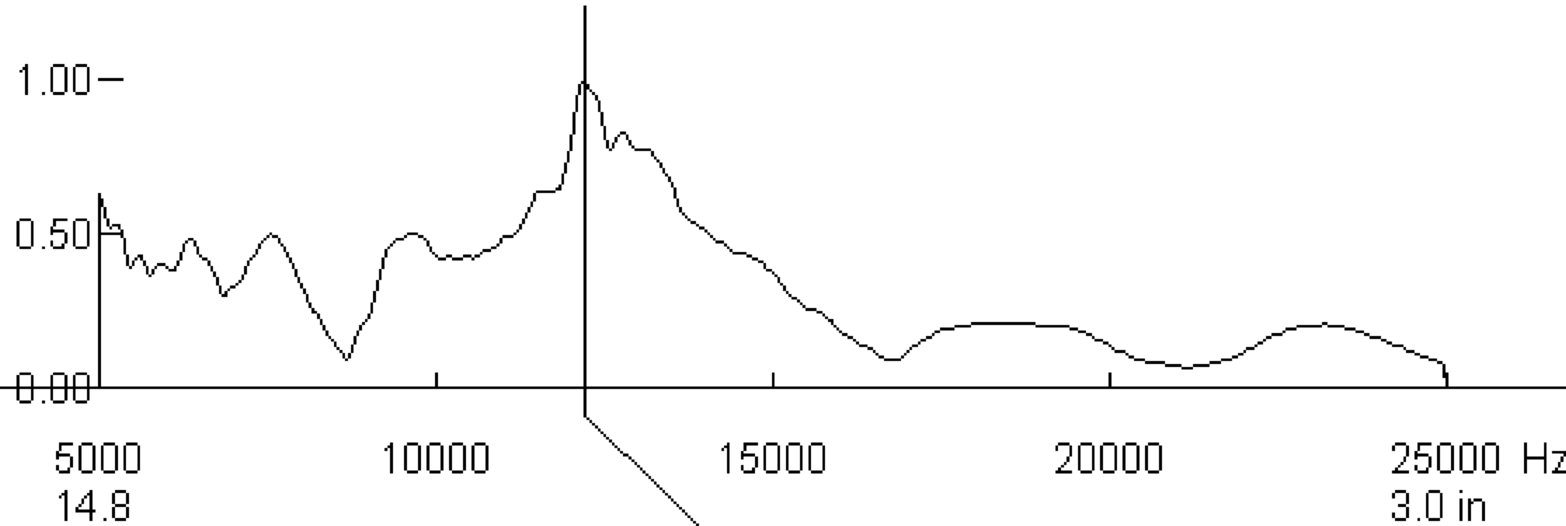
GRL Engineers, Inc.

Pile Dynamics, Inc.

ATTACHMENT D
FIGURE D3

RKCI STERLING

ID: D EAST WALL



WS: 12308 ft/s

03Feb2014 19:13

TH: 6.0 in
FR: 12234 Hz

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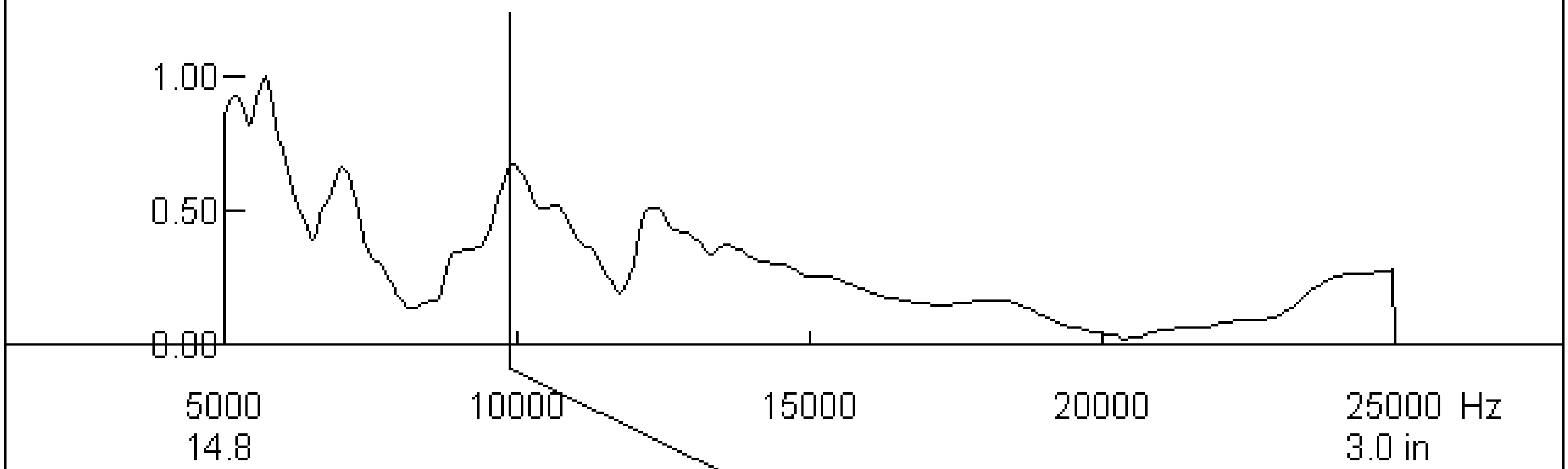
Pile Dynamics, Inc.

ATTACHMENT D
FIGURE D4

RKCI STERLING

ID: E SOUTH WALL



WS: 12308 ft/s

03Feb2014 19:16

TH: 7.5 in
FR: 9891 Hz

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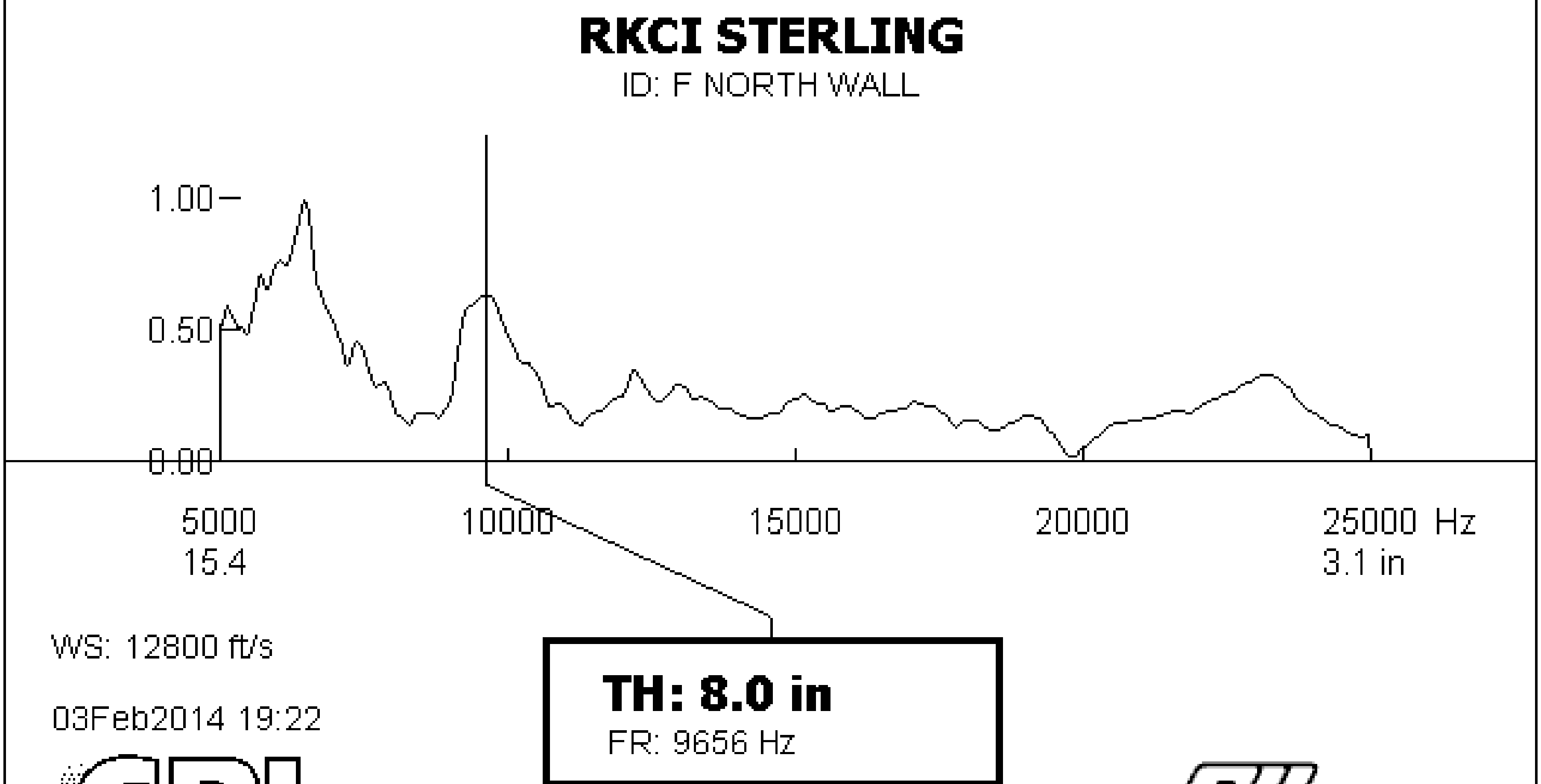
Pile Dynamics, Inc.

ATTACHMENT D
FIGURE D5



WS: 12800 ft/s

03Feb2014 19:22

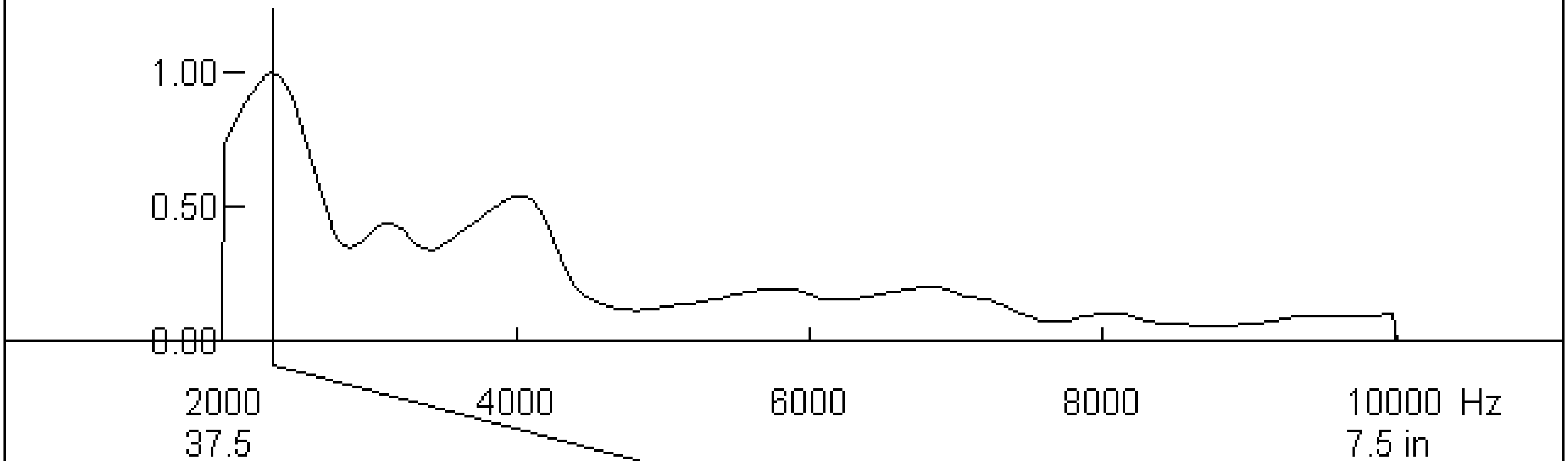
GRL Engineers, Inc.

Pile Dynamics, Inc.

ATTACHMENT D
FIGURE D6

RKCI STERLING

ID: RESTROOM ENTRANCE



WS: 12500 ft/s

03Feb2014 19:33

TH: 32.0 in

FR: 2344 Hz

GRL Engineers, Inc.

Pile Dynamics, Inc.

ATTACHMENT D
FIGURE D7