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SUBSURFACE INVESTIGATION

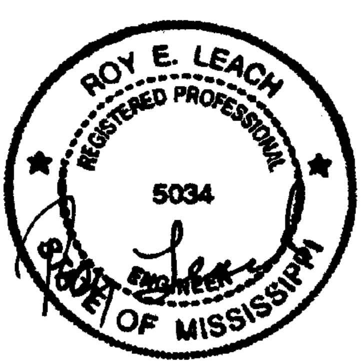
FOR

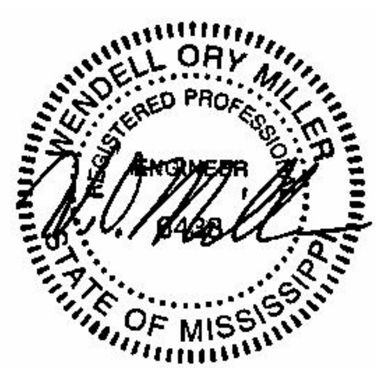
HOME 2 SUITES BY HILTON
MAXWELL DRIVE
VICKSBURG, MISSISSIPPI

DECEMBER 2016

BY

GEOTECHNICAL ASSOCIATES NETWORK, LLC
110 BEECHTREE ROAD
VICKSBURG, MISSISSIPPI 39183-7464





SUBSURFACE INVESTIGATION FOR
HOME 2 SUITES BY HILTON
MAXWELL DRIVE
VICKSBURG, MISSISSIPPI

PURPOSE

The purposes of this subsurface investigation are as follows:

a. To determine the general characteristics of the subsurface soils within the area of the proposed construction;

b. To determine by field and laboratory testing, the physical characteristics of the foundation soils and the soil samples collected; and

c. To make recommendations for foundation construction at this particular location.

FIELD INVESTIGATION

Seven subsurface borings were made for the proposed construction of the Home 2 Suites by Hilton on Maxwell Drive, Vicksburg, Mississippi. The borings were advanced with a truck-mounted, powered, continuous-flight auger. Auger cuttings of the soil medium were collected at changes in strata, and at intervals not exceeding five feet in depth. All samples taken were stored in sealed containers for later classification and testing. In addition, standard penetration resistance values (see ASTM D-1586-84) were determined and recorded on the boring logs for the various materials encountered. The Standard Penetration Test (SPT) gives an indication of the consistency and the in-place shear strength of cohesive soils and the relative density of cohesionless soils by recording the number of blows required, by a 140-pound hammer falling 30 inches, to drive a 2-inch O.D. splitspoon sampler one foot. Any static water levels noted in the borings while drilling or after completion of drilling and sampling operations at the site were measured and recorded on the boring logs.

LABORATORY INVESTIGATION

Laboratory testing of selected soil samples included visual classification, Atterberg limits on cohesive soils with determination of the plasticity index (PI), grain size analyses, and in situ moisture contents. Atterberg limits (liquid and plastic limits, ASTM D-4318-93) were run on the clayey soils in an effort to estimate the susceptibility of these soils to shrink and swell with changes in moisture content. These limits were run on samples selected from some of the various materials encountered. The liquid limit (LL) is the moisture content at which a soil changes from a plastic state to a viscous liquid state. The plastic limit is the moisture content at which a soil changes from a solid state to a plastic state. The plasticity index is the numerical difference between the liquid limit and the plastic limit and is indicative of the relative activity or sensitivity of a cohesive soil.

Grain size analyses (ASTM D-422-63) were conducted on representative samples of the various soils encountered to determine the particle size distribution of materials comprising the strata. Results of these tests were utilized in classifying the soils by the Unified Soil Classification System and in estimating the California Bearing Ratio (CBR) of the soils. Classifications for each of the soil samples are shown on the boring logs that are attached to this report.

To aid in the general interpretation of the soil conditions at the site, in situ moisture contents were determined for samples selected from the various soils encountered. This determination was made possible by placing extracted samples in sealed containers immediately upon removal from each interval. The results of these and other tests are recorded on the attached boring logs.

SUBSURFACE CONDITIONS

The proposed construction site for the Home 2 Suites by Hilton Hotel on Maxwell Drive is located in Section 22, Township 16 North, Range 4 East, Vicksburg, Warren County, Mississippi. This is in the Loess Bluff physiographic region of Mississippi and in the Gulf Coastal Plain region of North America. Structurally, the site is in the Mississippi Embayment. The soils in this area are derived from the Pleistocene Loess deposits. These loess deposits are variable in thickness, but their engineering properties are fairly consistent if the loess is undisturbed.

Seven borings were placed at the site: five to depths of 25 feet in the building footprint, and two to depths of 10 feet in the parking area. The materials encountered consisted of lean clays (CL), silt (ML), and clay-silt (CL-ML), as shown in the Soils Data Table below. As inferred from the SPT data, the consistencies of the clays and silts ranged from soft to very stiff.

Soils Data Table
Home 2 Suites by Hilton Hotel
Maxwell Drive
Vicksburg, Mississippi

Boring No.	Lean clay CL	Silt ML	Clay-Silt CL-ML	Total Depth
B-1	0' - 20'	20' - 25'		25'
B-2	0' - 25'			25'
B-3	13½' - 15'	2½' - 13½'; 15' - 25'	0' - 2½'	25'
B-4	0' - 18½'; 23½' - 25'	18½' – 23½'		25'
B-5	10' - 25'	0' - 10'		25'
P-1	0' - 10'			10'
P-2		0' - 10'		10'

Depths are in feet (') below the surface.

The lean clays (CL) were found in all but Boring No. P-2 as shown in the Soils Data Table above. Rock and debris were noted between 20 feet and 23½ feet in Boring No. B-2. An odor was detected in the 10-foot to 13½-foot interval of Boring No. B-4 with roots and organic materials noted at 15 feet of depth in this boring. The color of these materials consisted of various combinations of tan, gray with some dark gray and reddish tan noted. The SPT data for these lean clays suggested the consistencies varied from soft to very stiff, with measured blows counts ranging from 4 blows to 22 blows and averaging 11.7 blows. The field moisture contents ranged from 8.2 percent to 24.6 percent and averaged 19.6 percent. These are low to medium plasticity materials with plasticity indices ranging from 8 percent to 22 percent (averaging 13.2 percent) and liquid limits ranging from 30 percent to 43 percent (averaging 35.3 percent).

These lean clay materials have a low to moderate shrink/swell potential and are subject to small to moderate changes in volume with changes in moisture content. The percent passing the #200 grain-size sieve ranged from 96.0 percent to 99.7 percent and averaged 98.8 percent.

Silts (ML and CL-ML) were encountered in five of the borings at this site (see Soils Data Table above). These materials were varying combinations of tan, brown, and gray in color. Consistencies were medium to very stiff as inferred from SPT data that ranged from 7 blows to 21 blows per foot and averaged 11.8 blows per foot. These are low plasticity materials with plasticity indices that ranged from 3 percent to 9 percent (average 7.5 percent) and liquid limits that ranged from 29 percent to 35 percent (average 31.7 percent). Shrink/swell potential was low and only small changes in volume would be expected with changes in moisture contents. However, these loessal silts are subject to piping. Field moisture contents ranged from 11.0 percent to 30.2 percent and averaged 21.0 percent.

No static water levels were noted during or after completion of drilling and sampling operations. The actual water table at the site can only be determined with long-term observations. We note that groundwater conditions in this area do fluctuate during the year with variations in rainfall and other environmental factors. Therefore, the groundwater levels and soil moisture contents in the near-surface materials will vary throughout the year and will probably be different if tested at a different time.

RECOMMENDATIONS FOR SITE PREPARATION AND FOUNDATIONS

We understand that this project will consist of a Home 2 Suites by Hilton Hotel on Maxwell Drive, Vicksburg, Mississippi. The following conclusions and recommendations are based on our understanding of the proposed construction, information gathered during the exploration, accepted geotechnical engineering principles and practices, and our experience with similar sites and subsurface conditions. This report has been prepared for the exclusive use of Roy Patel, CHA, Brandon, Mississippi in the planning and design of the hotel. We request that we be informed of any significant changes to the proposed construction so we might review our recommendations in light of the new information. We should also be given an opportunity to review the final foundation and grading plans, as well as applicable portions of the project specifications, prior to construction.

Final plans and specifications are based on a site that will be graded essentially flat. It is our opinion that the proposed construction could be supported by a combination of foundation units, such as grade beams and spread footings. The foundation could consist of a monolithically cast, reinforced concrete, slab on-grade with turned-down, continuous grade beams and interior stiffeners to produce a beam diaphragm system. Column loads could be supported by isolated spread footings or thickened sections. Further details of our recommendations are discussed below.

SITE PREPARATION

As noted above, the near-surface material occurring under the construction area consisted of interbedded lean clay (CL) and silt (ML and CL-ML) as shown in the Soils Data Table above. Some rock, roots, organics, and debris were found near 15 to 23 ½ feet deep. Consistencies of the clays and silts were soft to very stiff.

The hotel will be a four-story structure constructed on a grassy area. We recommend that the foundation soil be excavated a minimum of 1 foot below the existing contours to remove any organics, topsoil, concrete, asphalt, debris and gravel. For the area near the outside of the building, the excavation should extend a minimum of 3 feet beyond the perimeter of the proposed building.

It is our understanding that elevators are generally operated by a piston founded approximately 8 feet in depth below the FFE of the ground floor. If the hotel elevators are to be founded at 8 feet, we recommend excavating a total of 6 feet more of the in place soil below the 8 feet and replacing this material with compacted select fill to ensure the foundation has sufficient strength to support this load. This excavation should extend a minimum of 3 feet outside the footprints of the elevators.

There will be a swimming pool on the south side of the hotel. The boring data indicate silt (ML) material down to 10 feet below the surface. The foundation soil should be excavated a minimum of 1 foot below the ground surface to remove any organics, topsoil, and debris. After the removal of the topsoil, we recommend that the deepest point in the pool be 5 feet of depth. The excavation should be cleared within an area beneath and extending a minimum of 10 feet beyond the perimeter of the pool, if possible. Any excavated lean clay (CL) materials could be used as select fill if these materials meet the specifications below and if the proper moisture content and compaction control are maintained.

COMPACTION CONTROL

Following the excavation we recommend that the subgrade in all areas be evaluated by a geotechnical engineer or his representative prior to fill placement. The engineer may recommend proof-rolling the areas as a means of evaluating the suitability of the subgrade for fill. Proof-rolling consists of systematically patrolling the area, preferably in perpendicular directions, utilizing a heavily loaded dump truck (minimum 20 tons) or other suitable vehicle approved by the engineer. Any areas which pump or rut excessively, and which cannot be densified by continued rolling, should be undercut to suitable material and properly backfilled. If proof-rolling is not possible, the sub-grade beneath the buildings could be evaluated at selected locations with a hand-held Humbolt Cone Penetrometer or equivalent. The measured penetration resistance at each location can be subsequently converted to an in situ bearing capacity for the foundation.

Select structural-fill material should then be placed in the foundation area in maximum loose lifts of 8 inches and be compacted to a minimum of 98 percent of the standard Proctor density (ASTM D-698-91) within 2 percentage points of optimum moisture content. Sufficient field-density tests should be conducted to insure compaction requirements are met during construction. As a rule of thumb, we recommend a minimum of two density tests be performed for each 2000 square feet of surface area per lift. In addition, monitoring of fill construction and compaction will result in minimizing future settlement of the fill and structures. Therefore, we believe that it is important that a qualified geotechnical engineer or certified technician monitor earthwork operations and that this work not be controlled by the earthwork contractor.

It is important that the select, structural-fill material should consist of a material having a liquid limit of less than 40 percent and a plasticity index between 8 percent and 20 percent. Any excavated materials that include topsoil, organics, and any debris should not serve as select fill and should be disposed of outside the foundation areas. Other material at the site that meets the specifications, noted above, could be used as select fill.

FOUNDATION STRENGTHS

The foundation system should bear in the cut or in the controlled, select fill at a minimum depth 24 inches below the finished grade elevation. Minimum depths needed to offset wind forces should be verified by your structural engineer. All foundation members should be reinforced both top and bottom, sufficient to resist differential movement, and the completed foundation system should provide for uniform distribution of applied loads to the bearing soils. After the placement of select fill, the maximum soil pressure under the foundation members should not exceed 2.1 kips per square foot for continuous foundation units or 2.4 kips per square foot for individual spread footings. Foundations sized in accordance with recognized criteria for the above stated allowable soil bearing pressure should provide a factor of safety of 2.0 - 3.0 against ultimate failure of the soil medium with total estimated settlements of 1.0 inch, more or less.

Note that the soils at this site contain lean clay (CL) and silts (ML and CL-ML), (as shown in the Soils Data Table above), all of which can lose strength with increases in moisture content. Therefore, it is important to properly control the moisture content of these soils during construction. Any foundation soils in exposed excavations that become wet or soft should be removed and replaced with compacted select fill prior to footing installation.

After the construction is completed, it is also important to control moisture content of the foundation soils. Inspections of several buildings that have had differential movement have noted that the gutters exit beside the foundations and that the swales do not have adequate slopes to quickly remove surface water. The final site-grading plan should provide for quick runoff of surface waters away from the building foundations in all directions. Beds for flowers and shrubs should not be boxed in and should be sloped down away from the building foundation. Sprinkler systems located close to the building foundation should be controlled by nearby soil moisture content and not specific time schedules. The landscape plans should insure that large water-consuming trees and shrubs are not located within 50 feet of the perimeter of the foundation members. Where any large trees or stumps are removed or where any plumbing or electrical trenches are cut under the foundation, select-fill material should be used as fill and should be compacted.

All foundation recommendations made in this report are contingent upon proper execution of the earthwork requirements noted herein. We believe that it is very important that a qualified geotechnical engineer familiar with working with these type soils be present after excavation and during fill placement. In addition, sufficient field density tests should be taken to insure that the compaction criteria are satisfied and to reduce the possibility of differential settlement at this location.

RECOMMENDATIONS FOR PARKING AREAS AND ACCESS DRIVES

The near-surface materials at the site, which will be the in situ material for the subgrade for the parking areas and access drives, were composed of interbedded lean clays (CL) and silts (ML and CL-ML) as shown in the Soils Data Table above. Consistencies of these materials above 5 feet of depth were stiff to very stiff.

The foundation soil should be excavated a minimum of 1 foot, independent of the amount of select fill to be used, to remove any topsoil, organics, debris, concrete, or soft material. Any soft or wet areas encountered during construction which cannot be stabilized should be undercut another 2 feet and filled with compacted select-fill material.

We recommend proof-rolling the area as a means of evaluating the suitability of the subgrade for fill or pavement support. Proof-rolling is defined above. We recommend that, after proof-rolling, the subgrade soils for any cut sections should be compacted to 98 percent standard Proctor density (ASTM D-698-91) within 2 percentage points of optimum moisture content to a depth of 8 inches.

Compacted select fill should then be placed to bring the subgrade up to elevation where required. Prior to placing the select fill in any area, we recommend that the subgrade be evaluated by a geotechnical engineer or his representative to determine the suitability of the subgrade.

Select-fill material should consist of a soil having a liquid limit of not more than 40 percent and a plasticity index between 8 percent and 22 percent. This soil should be placed in maximum loose lifts of 8 inches and also compacted to a minimum of 98 percent standard Proctor density. Compaction for the entire site could be attained using a rubber tired or sheeps foot roller. After preparation of the subgrade, the remaining pavement structure can then be placed according to the recommendations provided below.

Based on the type of soils encountered, we anticipate that a CBR value greater than 3 will be representative of the strength of the prepared subgrade soils and compacted fill placed at this site, assuming proper control of the soil moisture content. It is our assumption that the parking areas and access drives will be used by the visitors, employees, and a minimum number of two-axle trucks for any deliveries; this precludes street traffic. Based on that assumption and the soil properties, we have selected a Structural Number (SN) of 2.3 for the parking lot and 2.9 for the access drive design and the dumpster pad (based on AASHTO Guide for Design of Pavement Structures, Chapter 4, Low-Volume Road Design, 1986). The following pavements should be used, assuming proper compaction of the subgrade soils.

PARKING AREAS

Alternative #1

a) Base Course - Five (5) inches of hot mixed Bituminous Base course (BB-1, Type 6) conforming to Mississippi State Highway Department (MSHD) Specifications.

b) Surface Course - One and one half (1½) inches of hot mixed bituminous Surface Course (SC-1, Type 8) conforming to MSHD Specifications.

Alternative #2

a) Granular Subbase - Six (6) inches of crushed limestone, No. 610 conforming to MSHD Specifications.

b) Base Course - Four (4) inches of hot mixed Bituminous Base, (BB-1, Type 6) conforming to MSHD Specifications.

c) Surface Course - One and one-half (1½) inches of hot mixed bituminous Surface Course, (SC-1, Type 8) conforming to MSHD Specifications.

Alternative #3

Surface Course - Five (5) inches of Portland Cement Concrete.

ACCESS DRIVES

Alternative #1

a) Base Course - Six and one-half (6½) inches of hot mixed Bituminous Base, (BB-1, Type 6) conforming to (MSHD) Specifications.

b) Surface Course - One and one-half (1½) inches of hot mixed bituminous Surface Course, (SC-1, Type 8) conforming to MSHD Specifications.

Alternative #2

Surface - Six (6) inches of Portland Cement Concrete.

DUMPSTER PAD

Surface - Six (6) inches of Portland Cement Concrete. The dumpster pad should be the total length of the dumpster and the garbage truck.

The concrete pavement recommendations are for non-reinforced Portland Cement concrete pavement placed on a eight-inch-thick 610 limestone base course placed on the compacted subgrade. The base course should be compacted to a minimum of 98 percent standard Proctor density immediately prior to concrete placement. The concrete should have a minimum 28-day flexural strength of 650 psi and a compressive strength of 4,000 psi. Joint spacing, joint configuration, mix design, mix placement, and curing should conform to the recommendations of the American Concrete Institute (ACI) and the Portland Cement Association (PCA).

Applicable Mississippi State Highway Department specifications and structural number coefficients utilized in the pavement recommendations are provided as follows:

a) Bituminous Surface Course - Structural Coefficient = 0.44- hot mixed bituminous Surface Course (SC-1, Type 8) - Mississippi Standard Specifications for Road and Bridge Construction (1990 edition), Section 703, Pages 703-14&15 or from the AASHTO Interim Guide for Design of Pavement Structures.

b) Bituminous Base Course - Structural Coefficient = 0.34 - hot mixed Bituminous Base Course (BB-1, Type 6) - Mississippi Standard Specifications for Road and Bridge Construction (1990 edition), Section 703, Pages 703-14&15 or from the AASHTO Guide.

c) Granular subbase - Structural Coefficient = 0.11 - crushed limestone, No. 610, ASTM D 2940-98 Specifications or from the AASHTO Guide.

All pavement design recommendations made in this report are contingent upon proper execution of the subgrade requirements noted herein. We believe that it is very important that a qualified geotechnical engineer, familiar with working with such soils, be present after excavation and during proof-rolling, fill, and compaction. In addition, sufficient field density tests should be taken to insure that the compaction criteria are satisfied, and to reduce the possibility of settlement at this location. It is important that a good drainage system be established to quickly remove surface water, thus leaving no standing water.

REPORT LIMITATIONS

The recommendations made in this report are based on the assumption that the borings are representative of the subsurface conditions throughout the site. Therefore, we cannot warrant that our boring logs represent subsurface conditions at other locations or times. If any unusual or significantly different conditions are encountered during construction, we should be advised in order to review the changed conditions and subsequently reconsider any of the above recommendations.

Further, we are available to review those portions of the plans and specifications relating to earthwork and foundations for this particular project and request that we be retained to do so in order to determine whether the plans and specifications are consistent with the recommendations contained within this report. In addition, we are available to observe foundation construction procedures, including interpretation of the use of on-site materials and compaction of the structural fill, quality control of concrete placement, and other field observations and quality control measures as required.