

### **Pile Load Testing**

Considering that only one (1) deep boring was performed near the existing structure's footprint, it is possible that the soil profile varies across the footprint area. In view of this, there is a possibility that the piles may or may not develop "refusal" within the medium dense silty sand stratum (48-foot depth in boring B-1). It is recommended that probe types piles be driven throughout the site to establish driving characteristics and pile lengths. The probe piles should be of the same type and size as the job piles and should be installed with the same equipment and techniques that would be used to install the production piles.

Additionally, at least one (1) pile should be selected from the probe piles for a compressive static load test. The piles having the lowest driving resistance should be designated as a test pile for compressive static load tests. The test pile should then be permitted to "set" for a minimum of 14 days after driving, after which it should be load tested to failure in accordance with ASTM D1143, or Section 804.11 of the Louisiana Standard Specifications for Roads and Bridges, latest edition. The pile load test would be useful for confirming the static, long-term compressive pile capacity. The test pile program should be monitored and/or performed by a representative of PSI.

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### **Vibration Monitoring**

Thresholds of vibration induced cracking are generally site specific and depend on the type and age of the structure, the frequency of ground vibration, and the type of soil supporting the structure. Research by the U.S. Bureau of Mines (USBM) and other investigative groups have established criteria relating the occurrence of structural damage to certain frequencies and level of ground motion. According to the USBM, within the range of 4 to 12 hertz, the maximum particle velocity recommended to preclude the threshold damage to plaster-on-wood for old structures is 0.5 inch per second (ips). Please note that a threshold of 0.25 ips has been adopted by the local engineering community and is recommended for the project. Furthermore, a site specific survey to collect vibration data during performance of the load test and during driving of the project piles is recommended.

### **Pavement Recommendations**

The performance of pavements depends upon several factors including 1) the characteristics of the supporting soils; 2) the magnitude and frequency of wheel load applications; 3) quality of construction materials; 4) the contractor's placement and workmanship abilities; and 5) the desired period of design life. Our scope of services did not include extensive sampling for determination of Coefficient of Subgrade Reaction (K) value and California Bearing Ratio (CBR) of existing subgrade or potential sources of imported fill for the specific purpose of a detailed pavement analysis. Instead, the subgrade soils were evaluated based on our limited testing. Additionally, the anticipated traffic on the proposed pavement is not known at this time.

The exposed subgrade should be prepared as discussed in the "General Site Preparation- Non-Pile Supported Areas" section of this report. AASHTO design methodology could be used to



design the pavements. According to AASHTO design methodology, the pavement design thickness considers pavement performance, traffic, subgrade soils, pavement materials, environment, drainage and reliability. Traffic typically includes several types of vehicles with various magnitudes of axle loads that may be converted to a number of 18-kip equivalent single axle load repetitions. The Design Engineer should compute the number of ESALs repetitions that would be subjected to the pavement during its design life. Based on the computed ESALs, an economical and appropriate pavement can be designed accordingly.

For this site, it is our opinion that rigid (concrete) pavement be used in order to provide smoother travel surface and longer design life considering the heterogeneity of the near surface soils, the presence of miscellaneous fill, the high compressibility of the underlying soils and the possible former use of the site. In addition, concrete pavement is less susceptible to experiencing distress due to extreme variations in seasonal ambient temperature unless a "superpave" type asphalt mix is used. For the purpose of analysis, it was assumed that some areas of the pavement improvement will be restricted to typical commercial type traffic that consists of passenger vehicles and light pickup trucks. Meanwhile, some areas of the site (entrances, drives, dumpster area, etc.) will be subjected to occasional heavier traffic (garbage trucks, delivery trucks, etc.) Based on AASHTO design methodology and our experience with similar projects in the local area, we are providing pavement thickness for a rigid pavement system in Table 4. The table includes pavement sections corresponding to generic traffic levels (total ESALs), as design information was not provided to PSI at the time of this report. In general, pavement thicknesses corresponding to the light duty may be considered for auto parking areas, while the heavy duty may be considered for driveways, exit and entry lanes and frequently used areas.

**Table 4: Suggested Rigid Pavement Section**

RIGID PAVEMENT		
Pavement Materials	Minimum Thickness, inches	
	Light Duty <sup>(1)</sup>	Heavy Duty <sup>(2)</sup>
Portland Cement Concrete	5	7
Compacted Structural Fill	12	12

<sup>(1)</sup> Light duty pavement sections should be placed in the proposed passenger vehicle parking areas. This should be considered in areas not expected to be traversed by "heavy" truck traffic.

<sup>(2)</sup> Heavy duty pavement sections should be placed in the proposed drive lanes and entrance/exit areas.

The final pavement sections should be adjusted by the project Civil Engineer only if the anticipated traffic differs significantly from the assumed commercial type traffic. The selected pavement section should be based on the actual design traffic loading criteria for the project when that information becomes available. PSI can assist with the final pavement section design if requested.

Reinforced Portland Cement Concrete pavements should be utilized where waste disposal containers and grease traps are located. The concrete paved area should be sufficiently large so that the front wheels of the collection truck are supported on the rigid pavement. In this area and in areas that will be accessed by heavy trucks (fire engine, solid waste trucks, delivery trucks, etc.), a minimum concrete pavement thickness of seven (7) inches underlain by 12 inches of compacted structural fill is recommended. Consideration could be given to using wire mesh or fibers to reinforce pavements particularly those expected to experience heavy garbage trucks; delivery trucks, etc. Consideration could also be given to using thicker concrete



pavement in the dumpster areas which typically experiences higher localized pressures during dumpster pick up.

All paving recommendations are based on stable subgrade. Subgrade areas which are unstable must be over-excavated and replaced or otherwise rendered stable (via hydrated lime/fly ash/kiln dust treatment) prior to proceeding with base material placement. All site pavements should be underlain by a minimum of 12 inches of structural fill. Fill in pavement areas should consist of imported material.

Proper finishing of concrete pavement requires the use of appropriate construction joints to reduce the potential for cracking. Construction joints should be designed in accordance with current Portland Cement Association and the American Concrete Institute guidelines. Joints should be sealed to reduce the potential for water infiltration into pavement joints and subsequent infiltration into the supporting soils. Load transfer devices at the pavement joints should be designed in accordance with accepted codes. The concrete should have a minimum compressive strength of 4,000 psi at 28 days. The concrete should also be designed with 5±1 percent entrained air to improve workability and durability.

Due to the relatively very soft to soft or loose character and heterogenous character of the soil subgrade at the site and associated long-term settlement potential of the underlying, it is recommended that a proper design be considered at the pavement and pile-supported structures interface to accommodate the settlement of the pavement, provide a smooth transition from the pavement to the pile supported sidewalk(s), and avoid abrupt and excessive grade change. Taking into consideration the anticipated fill depth within the parking areas, settlement on the order of four (4) to six (6) inches could be expected over the life of the pavement. It is recommended that flexible connections, capable of accommodating at least 12 inches of settlement be provided for utility lines exiting the building area to non-pile supported areas. Having a smooth transition at the entrances and sidewalk is critical for a publicly used facility

### **GENERAL CONSTRUCTION CONSIDERATIONS**

It is recommended that PSI be retained to provide observation and testing of construction activities involved in the foundations and related activities of this project. PSI cannot accept any responsibility for any conditions which deviate from those described in this report, nor for the performance of the foundations and pavements if not engaged to also provide construction observation and testing for this project.

Again, it is our opinion that methods, means and sequence of the proposed construction should be responsibility of the project contractor who should be specialized in this type of constructions. However, some general geotechnical comments are offered herein for considerations in this regard.

### **Moisture Sensitive Soils/Weather Related Concerns**

The upper soils encountered at this site are relatively sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, an increase in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

