

As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.

If controlling hydrostatic pressure behind the wall as described above is not possible, then combined hydrostatic and lateral earth pressures should be calculated for granular backfill using an equivalent fluid weighing 85 and 90 pcf for active and at-rest conditions, respectively. These pressures do not include the influence of surcharge, equipment or pavement loading, which should be added. Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided.

4.5 Pavements

Based on experience with similar projects, a portland cement concrete (rigid) pavement system is recommended for this site.

4.5.1 Subgrade Preparation

On most project sites, the site grading is accomplished relatively early in the construction phase. Fills are placed and compacted in a uniform manner. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade and many surface irregularities are filled in with loose soils to improve trafficability temporarily. As a result, the pavement subgrades, initially prepared early in the project, should be carefully evaluated as the time for pavement construction approaches.

The results of the exploration indicated that the pavement subgrade should consist of at least 12 inches of sand fill with shell fragments. Imported river pump sand (USCS Classification SM) with maximum 15% fines can be used to establish the finished subgrade for the pavement areas. Subgrade stability is a transient condition affected by weather and construction traffic. We recommend the moisture content and density of the top 12 inches of the subgrade be evaluated and the pavement subgrades subjected to a proof roll within two days prior to commencement of placement of additional fill, base construction, actual paving operations or placement of any formwork.

Areas not in compliance with the required ranges of moisture/density or are unstable under proof-roll should be moisture conditioned and re-compacted with a smooth drum roller to minimum 95% of standard Proctor (ASTM D698). Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills.

4.5.2 Design Considerations

Anticipated traffic volumes and loading conditions for this facility were not provided, but we have made assumptions based our experience with similar projects. We have also assumed 20-year design period. We expect that the pavements within the facility are likely to be subjected to the following loading conditions:

- Standard Duty: passenger vehicles at a frequency of 1,000 vehicles per week along with medium sized delivery and trash collection trucks at a frequency of less than 30 per week and no tractor-trailer trucks.

If different loading conditions are planned at the site we should be notified to revise our recommendations accordingly.

Due to the relative high moisture content and high water table, the underlying fat clays at this site below the surficial predominantly sand fill are considered to have low swell potential. However, these soft high plasticity fat clays are expected to be near normally consolidated and some remaining primary consolidation and long term secondary compression settlement of the pavements can be expected over the design life. It is common in the New Orleans area to incorporate a nominal amount of reinforcement into the paving to aid in resisting some potential differential movement across the jointed pavements. For this application, a reinforcement of #4 bars on 24-inch centers or an equivalent highway grade WWF is usually employed at the proposed longitudinal and transverse control and expansion joints. However, even if the recommendations for nominal joint reinforcement are followed, some pavement distress could still occur from long term differential movement. It is, therefore, important to provide for maintenance of cracks that may occur over time.

Pavement design methods are intended to provide structural sections with adequate thickness over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink/swell movements. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

Pavement performance is affected by its surroundings especially by presence of water. Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. The civil engineer should consider the following drainage recommendations and details in the design and layout of pavements:

- Final grade adjacent to parking lots and drives should slope down from pavement edges at a minimum 2%;
- The subgrade and the pavement surface should have a minimum $\frac{1}{4}$ inch per foot slope to promote proper surface drainage;

- Install pavement drainage surrounding areas anticipated for frequent wetting (e.g., maintenance areas, wash racks);
- Provide minimum 2-ft wide strips of non-woven geotextile fabric at all planned control and expansion joint locations to prevent the migration of sand fines through joints;
- Install joint sealant and seal cracks immediately;

4.5.3 Estimates of Minimum Portland Cement Pavement Thickness

Typical Pavement Section Thickness (inches)	
Traffic Area	Portland Cement Concrete ^{1,2,3}
Standard Duty (Drive and Parking Areas)	6
Entrances & Trash Container Pad ⁴	8

1. 4,000 psi at 28 days, 4-inch maximum slump and 5 to 7 percent air entrained. PCC pavements are recommended for trash container pads and in any other areas subjected to heavy wheel loads and/or turning traffic.
2. Standard design and construction details for rigid pavements are contained in ACI330R-08. It is recommended that the design engineer refer to this document for more detailed information. A critical aspect of concrete pavements for facilities of this nature is joint spacing and related details. ACI330R-08 addresses these important details.
3. Rigid (portland cement concrete) can be placed directly on the stable existing or additional silty sand fill (compacted to a minimum 95% of the standard proctor maximum dry density) incorporating minimum 2-ft strips of geotextile fabric (Mirafi 140N or equivalent) at each planned control joint locations.
4. The trash container pad should be large enough to support the container and the tipping axle of the collection truck. The trash container pad should be designed as a structural slab for the anticipated axle loads.

4.5.4 Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. We recommend that preventive maintenance should be planned and provided for through an on-going pavement management program to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance, consisting of crack and joint sealing, and patching as necessary, is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations