

Complexities of Managing a Deep Dynamic Compaction Project for the Green Developer

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In south Florida, rising prices of vacant land and unavailability of large parcels of virgin land for development have forced land developers to look into developing old and newly filled lakes. The land price for these lakes is significantly lower than the virgin land and deals are arranged to incorporate the cost of improving the lakefill land into a developable land in the purchase price. Aside from environmental issues that are handled by environmental engineers in relation to obtaining development permits, the ground itself must be improved to sustain the stability needed to bear the proposed development load. Deep Dynamic Compaction (DDC) is proven to be the most economical option for low rise and lightweight developments, such as commercial or industrial warehouses.

Design Methodology

The model developed for the Federal Highway Administration (FHWA) report entitled “Dynamic Compaction, Geotechnical Engineering Circular No. 1”, by Robert G. Lukas, dated March 1995, is the primary basis of most DDC programs. Experience of the engineer with the type of the material below the surface is important because the type of material plays an important role in selecting the DDC design parameters used in the model. The design methodology considers four categories of materials: pervious grained soil, semi-pervious

soil, partially saturated impermeable deposits, and landfills. The fourth category, landfills, covers waste materials in old landfills but also the material used to fill lakes to create land for new development at a later date.

The material going into a lake may vary depending on the age of the fill placed in the lake. Older lakes filled with debris may include materials



Figure 1 - Dynamic compaction crane and weight.

that today would never be allowed; while newer lakes are in accordance with state or local regulatory agency environmental permits, which follow a monitoring protocol during filling. The debris in newer lakes may consist of concrete debris, soils, tiles, and any other types of materials classified as clean debris in accordance with the material definitions in the rules.

Parties Involved

There are three primary parties involved in this type of brownfields work including the developer, the banker, and the future buyer. Each party has a learning curve to understand and protect their interests. The developer is the most cautious

group because they, very rightfully, have reservations regarding the effectiveness of DDC on the planned investment.

Process Involved

Engineers will need several one-on-one and one-on-group teaching sessions with the developer’s primary engineer in charge of the project, and gradually meeting with the engineer’s boss, project director, and, eventually, the executives of the developing firm. Past successful experience with similar projects play a very important role in justifying the DDC methodology; engineers need to have accurate data and unit costs in tabulated form as part of their arsenal for convincing those in the learning curve.

The process becomes even more complicated for the engineer who

has designed the DDC program, and prepared plans and specifications for implementation of the program when the project goes to bid by DDC contractors. To win the work, it is typical for each DDC contractor in the bidding process to return to the client with their version of a DDC program and sometimes less expensive one to put themselves ahead of others. The alternative plans will propose using different equipment—usually the specific equipment that the bidding party already owns, or modeled under a different set of design parameters than the ones prepared by the engineer. Expect communications to become intense, and even with a now more educated developer, they will question

every detail of the original planned design. It can be a frustrating and confusing period for all parties.

The engineer must plan to routinely justify his/her design based on design methodologies in literature, justify the design parameters used in the development of the DDC program, and rely heavily on the past performed projects going back a couple of decades. The engineer should even be prepared to obtain permission from past project owners to show the integrity of the building slabs after being in service for many years.

The DDC designer may also need to obtain design parameters from the DDC contractor who has come up with an alternative design to analyze their design and determine any shortcomings in it. If found, further discussions ensue to reexamine the design at hand as the most reliable and the most effective for the developer. Innovation is wonderful, but an expert engineer will not risk the developer’s investment and reputation using unproven technologies; proven technologies are already part of a reputable engineer’s DDC design.

The best way for inexperienced developers to go through the design and implementation phases of such projects is to find an experienced firm with a significant number of similar projects in its experience and trust the outcome of the work by that design firm. Otherwise, the developer will have a very difficult time sorting out the complexities and questions that alternative designs bring forward. The claims of less expensive scenarios without long-term performance justification as to how the foundation will behave over the long term are too

risky. The combination of dealing with a new concept for which the developer has no experience and justifying the financial aspects of a properly designed DDC program can make a project even more difficult for an inexperienced developer.

Recommendations

A developer’s project manager should plan to spend significant time with the DDC designer to become familiar with the DDC concept, construction nuances, and the financial aspects of the project. The project manager will need to visit past projects performed by the designer’s firm to confirm claims by the design engineer. Only at that point, the developer’s project manager should proceed with convincing his/her superiors of the validity of the DDC program while asking for assistance from the DDC designer.

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