BUILDING TECHNOLOGY REPORT

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Date

Building Technology Report

Question 2

Budget, soil types, design loads, adjacent structures, the technology available, type of structure, conditions adjacent to the site are among the factors that are considered when selecting the type of foundation to use when constructing a building. The loading conditions (magnitude and type of loads) and the foundation material are of particular importance in the design of foundations. According to Chudley and Greeno (2013), the bearing soil at the site should be able to withstand the pressure transmitted by the specific type of foundation adopted by the structural engineer (p. 24). In this regard, the foundation material should be able to support the dead weight resulting from both the super and substructure while providing a safety margin sufficient to accommodate imposed loads from winds and building occupants.

The ground conditions at the proposed site justify the use of pile foundation in this project. According to site investigations, the subsoil is made up of mixed boulder clays extending to a depth of an average of 8 meters overlying a range of sandstones, coal, and shale deposits from the carboniferous era. The use of other types of foundations particularly pad footings will necessitate the evacuation of the entire glacial deposits which will not be economically practical. Coduto (2015) affirms that shallow types of foundations such as strip footings are adopted when the soil near the surface is capable of accommodating the ultimate loading of the structure (p. 106). In this perspective, glacial deposits fail to meet the requirements of a shallow foundation since they are characterized by high degree of consolidation especially when wet. Buildings constructed on glacial materials undergoes a significant amount of elastic and secondary settlement resulting to wide cracks on the walls and often a total failure of the structure (Chudley and Greeno, 2013, p. 40). The soil conditions on the site have low shear strengths and cohesion

values, which ultimately results in low bearing capacity and thus, it is recommendable to adopt pile foundation.

The presence of mining in the locality and the adoption of a framed construction approach justifies the use of a pile foundation. Areas near deep mining sites are prone to subsidence and differential settlement of shallow foundations. According to Coduto (2015), machinery aided mining activities triggers vibration of the adjacent land making multistory buildings constructed on shallow foundations unstable (p. 120). In this light, the proposed project has three stories and is, therefore, likely to undergo wall deformation as a consequence of ground curvature attributed to the mining activities. A study conducted by Coduto (2015) on the effects of mining on the building foundations depicts that load bearing walls used in conjunction with strip footings undergoes a significant amount of cracking as a result of shock waves resulting from blasting activities and movement of heavy machinery working in mining sites (p. 132).

Pile foundations are also preferred in the construction of framed multistory buildings, where, live and dead loads are concentered at the point of application. Piles offer support to the loadings of the superstructure through either friction or endpoint bearing. Hu, Lian, and Chen (2016) ascertain that in instances where a firm foundation material is overlain by strata of compressible soils, steel, concrete or timber piles are used to transmit loadings to the bearing firm ground (p. 255). In this project the use of pile foundation can be supported by the fact that shallow footings resting on weak soils depict a relative inability to resist lateral, inclined, overturning moments, and uplifting loads (Kibert, 2016, p. 178). Some of the pile foundation approaches that can be adopted for the project include bored piles and driven piles, which are prefabricated and brought on site for construction purposes. Hu, Lian, and Chen (2016) state that driven piles are most effective in loose soils since they have a huge capacity to support

anticipated design loads in competent subsurface material as consequence of friction force present and end bearing support (p. 260). Driven piles are also cheaper in comparison to bored piles, which require the use of excavating tools such as the bucket-auger-core barrel.

Raft foundations could also be adopted in place of the piles. According to Knaack, Klein, Bilow, and Auer (2014), this type of foundation is adopted with an objective of spreading the ultimate load from the structure over a significantly larger area, normally the entire proposed site (p. 234). The use of raft foundation is based on the relationship between pressure and the area it acts upon. Kibert (2016) affirms that the use of a concrete slab extending over the entire loaded area ensures that the pressure resulting from loads of the structure are minimized to a value approximately equal to the bearing capacity of the supporting soils (p. 200). Effective use of raft foundations entails stiffening the slab either by the use of ribs or cast in place beams. Coduto (2015) ascertains that raft foundations are needed on loose or soft soils with relatively low bearing capacity since they can spread the loadings on a large area and decrease the resulting pressure (p. 140). This type of foundation also ensures that differential settlements remain within the desired limits as the concrete slab resists movements between loading positions. Structural concrete with a minimum comprehensive strength of $25N/mm^2$ after 28 days is used in the construction of raft foundations. The slab is also reinforced with steel depending on the amount of hogging and sagging moments resulting from the weight of the building. Columns bases are then cast on the slab which acts as the footing for the piers (Knaack et al., 2014, p. 250).

Question 6

Safety is important in the construction industry owing to a wide array of parameters that can result in severe accidents in sites. In this regard, it is the duty of the contractor, designers, and project managers to ensure that the safety of the craftsmen, artisans, and laborers is

guaranteed. According to Hinze, Thurman, and Wehle (2013), approximately 1.3 million people in the United Kingdom suffered from a work-related illness in 2015 (p. 25). Cooper, Junginger, and Lockwood (2013) state that one hundred and forty-four people died at work and approximately 0.6 million individuals were involved in non-fatal accidents in 2013 (p. 422). The Construction Design and Management Regulations (CDM) 2015 were introduced to govern the manner in which all constructions projects are planned, with an objective of nurturing health and safety in the sector. Walker (2015) ascertains that CDM 2015 is an update of the 2007 regulations and aims at improving safety, health, and welfare of everyone working in the construction industry (p. 302). The guidelines accord unique duties to contractors, clients, and designers, to reconsider their perception of health and safety, in order to consider them through the lifecycle of a project.

Hinze, Thurman, and Wehle (2013) affirm that the regulations fall into five broad categories, with each part having a myriad of requirements (p. 27). In this case, part four, which deals with general requirements for all constructions sites is of particular importance. According to Cooper, Junginger, and Lockwood (2013), the most critical requirement of CDM 2015 is the one that details the need for safe construction sites (p. 430). According to the guideline, a proposed workplace should provide sufficient working space that is arranged in a manner that minimizes risks to individual entering and leaving the site and also those executing tasks geared towards implementing the project. In regard to this requirement, a construction site should at all times ensure that the health of all workers is upheld by designing measures that reduce infection resulting from dust and emissions from machinery (Hinze, Thurman, and Wehle, 2013, p. 28).

Stability of a structure is another requirement of CDM 2015 that aims at minimizing accidents resulting from the collapse of elements such as columns, beams, formwork, and walls.

It is the duty of the clerk of works and the site agent to ensure that all practicable steps are undertaken to ensure that any existing or new structural element doesn't collapse as consequence of ongoing construction work (Cooper, Junginger, and Lockwood, 2013, p. 450). In this regard, it is important that structures should be used for the purpose for which they were designed for and maintained occasionally in order to reduce unforeseeable circumstances that may lead to their collapse. CDM 2015 also require demolition of structures to be executed in a way that minimizes the chances of accidents to a practical value. The process of dismantling of structures should, therefore, be planned and the arrangements for such activities recorded in writing before the demolition work begin (Walker, 2015, p. 306). This provision protects those working at the site as well as individuals adjacent to the construction project.

The provisions of CDM 2015 stresses on the need for cofferdams and caissons in all projects close to any water body. Cooper, Junginger, and Lockwood (2013) define a cofferdam as a temporary structure meant to exclude water from the working area with an objective of ensuring the element under construction gains the required strength (p. 443). For instance, conventional concrete gains comprehensive strength with time and should be protected from excessive water surges for at least 28 days after casting. The regulations state that the caisson or cofferdam must be of suitable design and construction in order to permit workers to escape if materials or water enters it. According to Cooper, Junginger, and Lockwood (2013), a cofferdam should only be used in construction works if a competent person inspects it and he/she gets satisfied that the equipment guarantees safety to everyone on site (p. 489).

Provisions of CDM 2015 require the presence of emergency procedures that details how foreseeable emergencies should be addressed on site. Walker (2015) ascertains that in the interest of safety and health of the people in construction sites, there should be sufficient and suitable

arrangements for addressing accidents and must include procedures for evacuation of the working area (p. 345). In designing the aforementioned arrangements, consideration such as the type of work in progress, equipment under use, the number of people working on the project, and characteristics and size of the site are taken into account. For effective implementation of this requirement, each individual to whom the guidelines extend should be familiar with the arrangements (Cooper, Junginger, and Lockwood, 2013, p. 456).

CDM 2015 should be put into effect on the Triangular House project by ensuring that the project managers concerned with the health and safety of the employees communicate all relevant guidelines to the client, designers, and all the parties involved. According to Walker (2015), engaging and consulting with the workforce about the risks in the construction site and how to manage them serves as an effective intervention of ensuring that the legislations of CDM 2015 are integrated into the working environment (p. 355). Regulations such as those that require the presence of emergency procedures can be implemented in the project by having numerous printouts placed strategically on site. Some of the specific hazards that are applicable to Triangular House project include the collapse of excavation walls and instability of structural elements. Site investigations depicted that the ground conditions are unstable to the presence of the glacial deposits which extends to an approximate depth of 8 meters. If raft foundation will be adopted, there will be need to excavate the site and this will result to unstable excavation walls which may cave in (Cooper, Junginger, and Lockwood, 2013, p. 501). The presence of mining activities also contributes to the instability of the structural elements and excavation walls.

Question 8

Effective construction management is critical in ensuring that all times a project remains within the scope, budget limits, and schedule. The ability of a project manager to coordinate the

available human capital and materials influence the success rate of the proposed development. Owing to the dynamic nature of the construction industry, project coordinators face a myriad of challenges that have to be remedied through the best available course of action. In this regard, these professionals require skills such as solving problem, strong communication, knowledge of the construction processes, and other leadership skills (Harris and McCaffer, 2013, p. 256).

In regard to the Triangular House project, good project management must nurture effective utilization of materials, equipment, and labor. However, some challenges may emerge in an attempt to achieve the aforementioned goals. Need for high productivity at the site will affect construction management of Triangular House project in regard to machinery and location of temporary site accommodation (Griffith, Stephenson, and Watson, 2014, p. 45). Construction managers are mandated to ensure that human output is optimized at all stages of a project cycle in order to minimize chances of time and cost-overruns. Job-site productivity is influenced by factors such as age, experience, and skills of the workers, site accessibility, equipment utilization, and motivation of the workforce (Harris and McCaffer, 2013, p. 276). In this project, job site accessibility and machinery utilization are of critical consideration since they will present a myriad of challenges to the construction management team.

Accessing the site will be difficult due to the presence of Calston Street, Forth Street, and the Motorway adjacent to the proposed area of development. The labor productivity index is significantly lowered if workers must execute their duties in an area where they have to constantly avoid traffic (Chudley and Greeno, 2013, p. 50). In this regard, the traffic on the aforementioned streets will limit the optimum production of the workforce if the materials store and accommodation will be located on either of the roadways. Some of the measures used by construction managers to measure labor efficiency include functional units per labor hour and

labor productivity index. The method adopted for evaluating the contribution of the workforce depends on the scope of the project and nature of the particular task under execution. For instance, when casting concrete, labor productivity can be measured by the number of cubic meters placed in an hour (Griffith, Stephenson, and Watson, 2014, p. 85). Productivity indices track work output efficiency by considering the project size, its location, and technology available. In regard to movement corridors, the construction managers will have to deal with challenges linked to reduced output as a consequence of work distribution. The space designated for movement within the site limits the effective use of equipment since machine operators are concerned with the safety of the employees (Coduto, 2015, p. 130). Moreover, the corridors raise safety concern that the managers have to address in order to ensure that work related accidents and subsequent injuries are avoided.

The positioning of major plants such as lift cranes and excavators on the site will impact the degree of equipment utilization and mechanization which will have a direct impact on labor productivity. Strategic positioning of the equipment on site will optimize their performance and ensure a high degree of machine control which consequently, will result in enhanced output (Harris and McCaffer, 2013, p. 280). Excavation is a capital-intensive undertaking that managers of Triangular House project must execute owing to the nature of the ground conditions. In this regard, positioning the earthwork machinery will be of critical importance since it will influence the performance of the operators. Kibert (2016) affirms that proper position of major plants in a construction site ensures that non-productive activities are kept to a bare minimum and therefore, maximizing the productive labor yield (p. 210). The ratio of direct hours devoted to the execution of a project to the potential labor hours is increased when an equipment is located in a manner that minimizes its movement and frequent repairs.

In relation to material storage areas, construction managers have to address the challenges related to site space planning and natural factors, especially weather. Most of the materials used in the construction industry such as aggregates, cement, and steel bars require huge storage space due to their massive volume. Prefabricated elements such as beams and blocks also require substantial storage area on the site before they can be assembled. In this regard, the construction managers have to devise interventions of ensuring that the available site space is utilized optimally and sufficient area for accommodating materials is designated. Griffith, Stephenson, and Watson (2014) ascertain that construction managers have to organize the site in a manner that provides for access, drainage, circulation, safety, and security. Some of the building materials are also affected weather conditions especially rainfall and moist conditions. Effective design of concrete stresses on the need to use dry aggregates and moist free cement in order to minimize the chances of segregation and cracking of the composite material (Harris and McCaffer, 2013, p. 300). In this regard, the managers will face challenges related to ensuring that the material storage areas, especially those housing cement are water tight.

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Personal Description

A passionate, skilled and self-motivated academic writer with exemplary research and formatting skills. I apply a methodical approach towards all work related issues and my eagerness to learn is beyond doubt. My objective with Allwriting.net is to offer writing services and also acquire skills that will aid me to attain my dream of being a full-time writer.

Summary of Qualifications

1. Exemplary command of the English Language (Native speaker).
2. Ability to type at least 70 words per minute.
3. Access to various academic sources such online libraries, public libraries and learning institution materials.
4. Proven research skills.
5. Proficiency in MLA, APA, Chicago, and Harvard formatting techniques.

Professional Training

Ashford University: Bachelor of Arts in Business and Economics (2012).

Freelancing Experience

- 3 years of writing experience in various subjects such as Healthcare, Business, Economics, Psychology, Literature, Physics, Engineering, IT, Finance, and Mathematics.
- Successfully completed 22 data analysis projects with the aid of SPSS.
- Completed 10 Economics projects involving the use of Excel program.

Writing Companies Previously Worked For

1. Proficient Writers (2013-2014) - completed 39 projects.
2. Hire Writers (2014-2015)-completed 46 articles.
3. Easy Pro (2015-2016) -completed 35 projects.