Civil Engineering Functions

The functions of the civil engineer can be divided into three categories: those performed before construction (feasibility studies, site investigations, and design), those performed during construction (dealing with clients, consulting engineers, and contractors), and those performed after construction (maintenance and research).

Feasibility
In order to understand the responsibilities of a construction civil engineer, it is important to know about his role in his particular area. An engineer is expected to use his knowledge as well as his background to assure clients that the structures have been constructed in the most secure and a robust way, with safety being the highest priority. The construction civil engineers are not only involved in the designing aspect of the structures, but they are also responsible for the cost estimation of the construction material, planning the construction activities well in advance, preparing the schedule for the work to be done and last but not the least, avoiding overhead costs.

Feasibility studies are preliminary investigations into the potential benefits associated with undertaking a specific activity or project. The main purpose of the feasibility study is to consider all factors associated with the project, and determine if the investment of time and other resources will yield a desirable result. While considered a preliminary study, it is not unusual for a feasibility study to be highly detailed. Including a detailed survey, geological investigation, hydrological analysis, soil testing, design, cost estimation, construction supervision, labour and management

When a council or transportation departments of the local government is considering an improvement to its infrastructure, the feasibility study is a logical tool to employ before any resources are invested in the new project. One of the most important aspects of the study is to make sure that the total investment needed to successfully bring the project to completion is considered. Often, this will include addressing components such as cash reserves, labour, construction, production facilities, outsourcing, and the cost of raw materials. Only when the feasibility study has addressed the total cost of completing the project can the study progress to the next level.

As a second major component, the feasibility study will also address costs and other factors that are indirectly associated with the project. In the instance of creating improvements to the infrastructure for the purpose of relieving traffic congestion on busy roads or access roads to developments, local business, drivers and local authorities benefit by savings on transportation costs (fuel) and labour time in minutes, this second phase will look into the costs associated with reaching and cultivating a consumer base for the new proposals. The overall idea of these preliminary studies is to ensure that there is a reasonable understanding of what will be required to both construct the project, the time frame required, delays associated with the improvement which are normally relevant to busy sections of highways, successfully marketing of the finished projects and realisation of the savings and investment in the community.

The utilisation of a feasibility study has often assisted community's, developers and councils in understanding which projects to develop and which ones to abandon before investing resources in something that ultimately shows no promise of generating revenue application of savings or improvements to road safety. Taking the time to engage in a pilot or feasibility study does involve some usage of available resources, but these costs are much more readily absorbed than the larger amount that would be expended on a project that ultimately proved to be worthless.

A typical feasibility study illustrates helps present an idea or project to secure the required funding and support and convince others even if they are not familiar with the type of project. It also discusses how to identify crucial arguments and effectively explore the various assumptions and alternatives. It explains how to represent ideas in a simple, effective, convincing and objective manner, how to test, analyze the potential changes in various parameters and deal with possible deviation from projected cost or income. It offers guidance on how to present problems in a way which does not prejudice the project's prospects. A feasibility study of a project can optimize it before construction phases and help the start of saving time and money, help effectively plan and schedule projects, comprehensively analyze the proposals, prepare cashflow projections and properly predict the financial requirements.

No major project today is started without an extensive study of the objective and without preliminary studies of possible plans leading to a recommended scheme, perhaps with alternatives. Feasibility studies may cover alternative methods, e.g., bridge versus tunnel, in the case of a water crossing or, once the method is decided, the choice of route. Both economic and engineering problems must be considered. A preliminary site investigation is part of the feasibility study, but once a plan has been adopted a more extensive investigation is usually imperative. Money spent in a rigorous study of ground and substructure may save large sums later in remedial works or in changes made necessary in constructional methods. Since the load-bearing qualities and stability of the ground are such important factors in any large-scale construction, it is surprising that a serious study of soil mechanics did not develop until the mid-1930s. Kar von Terzaghi, the chief founder of the science.

Design

A construction civil engineer has to possess thorough knowledge of science, math, physics, and analyze the problems, while interpreting the data available. One of his many duties would involve visiting and analyzing the construction site first hand and also the various requirements that the construction job demands. By analyzing the important parameters of the construction job, the engineer can be expected to prepare a construction plan, which would help him in this respect. Another important aspect that the engineer has to adhere to includes careful examination of the equipment and material used for the construction purposes, to ensure the quality of the products and the material to be used.

The design of engineering works may require the application of design theory from many fields, e.g., mechanics, hydraulics, thermodynamics, or nuclear physics. Research in structural analysis and the technology of materials has opened the way for more rational designs, new design concepts, and greater economy of materials. The theory of structures and the study of materials have advanced together as more and more refined stress analysis of structures and systematic testing has been done. Modern designers not only have advanced theories and readily available design data, but structural designs can now be rigorously analysed by computers and their software programs.

Construction

An important aspect that the engineer has to adhere to includes careful examination of the equipment and material used for the construction purposes, to ensure the quality of the products and the material to be used. The construction civil engineer also has to follow the rules and other guidelines, which have been prescribed by the CDM(Construction Design and Management). He is constantly vigilant in respect to the construction work, any problems that arise in construction processes can effect the future of the project so he must be available to make any necessary changes with the best solutions and solving the issue with immediate effect. Many of these tasks are either resolved in the engineer's

office or at the construction site. Whatever the task may be, communication goes a long way in helping out the engineer in the fulfillment of his responsibilities.

Since most construction jobs are on a stringent time schedule, it is important to not only be able to solve the problems that arise but to do so in a quick and speedy fashion. Civil engineers are involved with the design, development and construction of a huge range of projects in the built and natural environment. Their role is central to ensuring the safe, timely and well-resourced completion of projects in many areas, including highway construction, waste management, coastal development and geotechnical engineering.

Consulting civil engineers liaise with clients to plan, manage, design and supervise the construction of projects. They work in a number of different settings and, with experience, can run projects as a project manager. Civil engineering offers many opportunities as well as the satisfaction of helping to improve and enhance public quality of life in many settings. The civil engineer must also be certain to follow land use laws and regulations every step of the way. This is extremely important as one who does not abide by such rules and regulations may find that the project is stalled, either temporarily or permanently. Therefore, a specific duty of a civil engineer is to know the pertinent land use laws and regulations and to follow them consistently.

Accurate pavement performance prediction is one of the most important, complex and difficult tasks, the result would be better roads and the saving of millions of pounds of tax payers revenue. Performance prediction methodology can help optimise the selection of proper pavement materials, drainage requirements and layer thickness for the pavement structure to exceed its design life now set at around 30 to 40years. Interaction among pavement layers (material properties and thickness), environmental condition, applied load and variance of these factors will dictate when and where distress will initiate as well as the rate at which this distresses will progress. The implementation of a mechanistic analysis, knowledge of material properties can play an important role in the determination of the response parameters such as the stresses and strains, key factors in mechanical breakdown of pavement structures.