Chapter One

Introduction

1.1 General Introduction

Fresh concrete is a fluid and has to be put into a container until it hardens. This container is called formwork, and contributes greatly to the shape and surface texture of the finished structure. One of the most pressures of fresh concrete during placing. [1]

Concrete formwork serves as a mold to produce concrete elements having a desired size and configuration. It is usually erected for this purpose and then removed after the concrete has cured to a satisfactory strength. In some cases, concrete forms may be left in place to become part of the permanent structure. For satisfactory performance, formwork must be adequately strong and stiff to carry the loads produced by the concrete, the workers placing and finishing the concrete, and any equipment or materials supported by the forms.

For many concrete structures, the largest single component of the cost is the formwork. To control this cost, it is important to select and use concrete forms that are well suited for the job. In addition to being economical, formwork must also be constructed with sufficient quality to produce a finished concrete element that meets job specifications for size, position, and finish. The forms must also be designed, constructed, and used so that all safety regulations are met. [3]

Formwork costs can exceed 50% of the total cost of the concrete structure, and formwork cost savings should ideally begin with the architect and engineer. They should choose the sizes and shapes of the elements of the structure, after considering the forming requirements

and formwork costs, in addition to the usual design requirements of appearance and strength. Keeping constant dimensions from floor to floor, using dimensions that match standard material sizes, and avoiding complex shapes for elements in order to save concrete are some examples of how the architect and structural engineer can reduce forming costs. [1]

The designer of concrete formwork must choose appropriate materials and utilize them so that the goals of safety, economy, and quality are met. The formwork should be easily built and stripped so that it saves time for the contractor. It should have sufficient strength and stability to safely carry all live and dead loads encountered before, during, and after the placing of the concrete. And, it should be sufficiently resistant to deformations such as sagging or bulging in order to produce concrete that satisfies requirements for straightness and flatness.

Concrete forms that do not produce satisfactory concrete elements are not economical. Forms not carefully designed, constructed, and used will not provide the surface finish or the dimensional tolerance required by the specifications for the finished concrete work .To correct concrete defects due to improperly designed and constructed forms may require patching, rubbing, grinding, or in extreme cases, demolition and rebuilding. [3]

To produce concrete forms that meet all job requirements, the construction engineer must understand the characteristics, properties, and behaviors of the materials used; be able to estimate the loads applied to the forms; and be familiar with the advantages and shortcomings of various forming systems. Form economy is achieved by considering four important factors:

- Cost - of form materials.
- Easy form fabrication.
- Efficient use of forms — erecting and stripping.
- Planning for maximum reuse to lower per use cost.

1.3 Statement of the Research Problem:

In construction industry, the freshly cast in place concrete elements (e.g. slabs, walls, etc.) are usually supported temporarily by a system of formwork until the imposed loads can be carried by the concrete structure itself formwork is an expensive component in most concrete structures.

Good judgment in the selection of materials and equipment, in planning fabrication and erection procedures and in scheduling reuse of form can expedite the job and cut costs.

Nowadays in Sudan using technological improvements in construction methods, materials and equipment plays key roles in productivity. As a result, casting one or two floors per week in multistory building has been very common, especially in metropolitan

For walls the use of concrete pump increases the placement rate of concrete to about 200 cubic yards per hour. While it is desirable to have a rapid construction progress, it is essential that the quality and safety of the structure be maintained.

Used several types of formwork in Sudan and most widely used is made from wood, steel and aluminum .To ensure the safety of formwork to be the correct design and construction of the form.

1.4 Objectives of the Research:

The aim and purpose of this study is to provide a clear detailed analysis on the factors that lead engineers used the ordinary method for formwork. this study has two main objectives

- To study the behavior of formwork during the construction of concrete structures, with focusing on the interaction of concrete placed and the structural element of formwork.
- To analyze and design of formwork for flat slab of building.

1.5 Research Methodology

In order to achieve the objectives mentioned, the following methodology can be followed:

1. Comprehensive work must be done about literature review about the behavior of formwork on focusing on its types, systems and its live time of it in addition to how it analyzed and designed.
2. Using spreadsheets (Microsoft office - Excel) as helping tool for the calculations of analysis and design of formwork.
3. Adopting case study by taking a flat slab as an practical example.

1.6 Hypotheses of the Research

Assuming that the outcomes and recommendations of the research have been applied practically, this may lead to:

- Decreasing the time.
- Decreasing the cost.
- Provide high quality for the product.
- Durability can be granted.

- Perfect and practiced

1.7 Research Outline:

This research contains five chapters detailed as follow:

Chapter One: (**Introduction**), which contains general introduction about formwork and explains the problem statement of the research with the proposed solution and the objectives of the research.

Chapter two: (**Literature review**), highlights the main parts of the Formwork, its types, systems and live cycle.

Chapter Three: (**Analysis, Design & Erection of formworks**) contains the theoretical part of the research about the procedure of the Analysis, Design & Erection of formworks.

Chapter Four: (Case Study) contains the practical part of the research by applying the theoretical part into applicable case study.

Chapter Five: (**Conclusions and recommendations**), summarizes the conclusions of the research and necessary recommendations