Civil Engineering Construction

DDA 2132

Introduction to Construction

Dr Mohamad Syazli Fathi

Department of Civil Engineering
UTM Razak School of Engineering & Advanced Technology
UTM *International Campus*

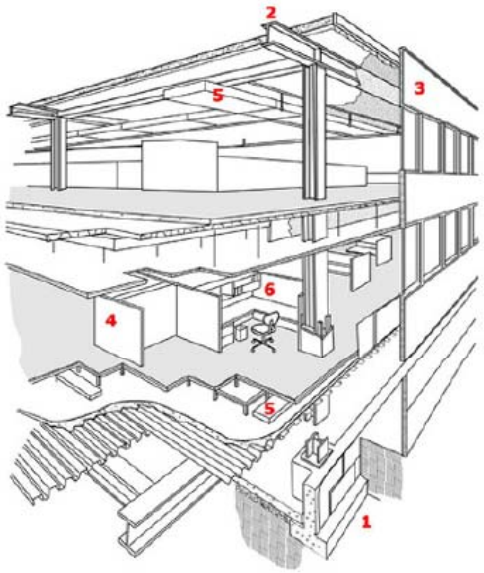
June 23, 2012

Construction Technology

- **Construction Technology** involves study on methods of construction to successfully achieve the structural design with recommended specifications.
- It also includes study of construction equipments, and temporary works required to facilitate the construction process.
- The modern trend is towards constructing lighter and taller buildings which is always a big challenge in an era of financial crunch. To achieve it successfully there is a need of have sophisticated equipments employed in the construction process.

Synopsis

- This subject consists of construction activities.
- Introduction to substructure: foundation and piles.
- Introduction to temporary works: scaffolds and formworks.
- Introduction to superstructure: Floors, Walls, Internal Fixtures and Fittings and Roofs.
- Introduction to external works.



Introduction to Construction

"It is a great profession. There is a fascination of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy. Then it brings jobs and homes to men. Then it elevates the standards of living and adds to the comforts of life. That is the engineer's high privilege."

-Herbert Hoover

Course Outline

1.0 INTRODUCTION TO CONSTRUCTION IN CIVIL ENGINEERING

1.1 Construction Activities
1.2 Site Preparations.
1.3 Definition of Substructure
1.4 Definition of superstructure and external works
1.4 Integration construction's components

Introduction

- Sociological changes, new technology in industry and commerce, new building codes, other new laws and regulations, inflationary economies of nations, and advances in building technology place an ever-increasing burden on building designers and constructors.
- They need more and more knowledge and skill to cope with the demands placed on them.

Introduction – cont. 1

- The public continually demands more complex buildings than in the past.
- They must serve
  - more purposes,
  - last longer,
  - and require less maintenance and repair.
  - As in the past, they must look attractive.

Introduction – cont. 1a

- Yet, both **building construction** and **operating costs** must be ***kept within acceptable limits*** or new construction will cease.
- To meet this challenge successfully, continual **improvements in building design** and **construction** must be made.
- Building designers and constructors should be alert to these advances and learn how to apply them skillfully. (**Ricketts** 2000)

Introduction – cont. 2

- One advance of note to building design is the adaptation of operations research, or systems design, developed around the middle of the twentieth century and originally applied with noteworthy results to design of machines and electronic equipment.
- In the past, design of a new building was mainly an imitation of the design of an existing building. Innovations were often developed fortuitously and by intuition and were rare occurrences. In contrast, systems design encourages innovation. It is a precise procedure that guides creativity toward the best decisions. As a result, it can play a significant role in meeting the challenges posed by increasing building complexity and costs.

Introduction – cont. 3

There are two general aspects to the construction of buildings (Greeno 1999):

1. Conventional or traditional methods
2. Modern or industrialized methods

Introduction – cont. 4

Conventional and traditional methods

- concentrate on smaller type of structure, such as a domestic dwelling of one or two storeys built by labour intensive traditional methods.
- Generally it is more economic to construct this type of building by these methods, unless large numbers of similar units are required on the same site.

Introduction – cont. 5

Modern or industrialized methods

- In these circumstances, economic of scale may justify factory manufactured, prefabricated elements of structure.
  - These industrialized manufacturing process used to produced complete elements, i.e. floors, walls, roof frames, etc. in modules or standardized dimensional increments of 50 mm. (Modular Coordination by CIDB Malaysia)

Building

A building is an assemblage that is firmly attached to the ground and that provides total or nearly total shelter for machines, processing equipment, performance of human activities, storage of human possessions, or any combination of these(**Ricketts** 2000).

Building design

- **Building design** is the process of providing all information necessary for construction of a building that will meet its owner's requirements and also satisfy public health, welfare, and safety requirements.
  - **Architecture** is the art and science of building design.
  - **Building construction** is the process of assembling materials to form a building.

Building design

- Building design may be legally executed only by persons deemed competent to do so by the state in which the building is to be constructed.
- Competency is determined on the basis of education, experience, and ability to pass a written test of design skills.
  - **Architects** are persons legally permitted to practice architecture.
  - **Engineers** are experts in specific scientific disciplines and are legally permitted to design parts of buildings; in some cases, complete buildings. In some states, persons licensed as **building designers** are permitted to design certain types of buildings.

Building construction

- Building construction is generally performed by laborers and craftspeople engaged for the purpose by an individual or organization, called a **contractor.**
- The contractor signs an agreement, or contract, with the building owner under which the contractor agrees to construct a specific building on a specified site and the owner agrees to pay for the materials and services provided.

SYSTEMS DESIGN AND ANALYSIS

- Systems design comprises a logical series of steps that leads to the best decision for a given set of conditions. The procedure requires:
  - **Analysis** of a building as a system.
  - **Synthesis**, or selection of components, to form a system that meets specific objectives while subject to constraints, or variables controllable by designers.
  - **Appraisal** of system performance, including comparisons with alternative systems.
  - **Feedback** to analysis and synthesis of information obtained in system evaluation, to improve the design.

Building construction

- Building construction is generally performed by laborers and craftspeople engaged for the purpose by an individual or organization, called a **contractor.**
- The contractor signs an agreement, or contract, with the building owner under which the contractor agrees to construct a specific building on a specified site and the owner agrees to pay for the materials and services provided.

systems design

- For a building to be treated as a system, as required in systems design, it is necessary to know what a system is and what its basic characteristic are.
- ***"A system is an assemblage formed to satisfy specific objectives and subject to constraints and restrictions and consisting of two or more components that are interrelated and compatible, each component being essential to the required performance of the system."***

MAJOR BUILDING SYSTEMS

- The simplest building system consists of only two components.
  - One component is a floor, a flat, horizontal surface on which human activities can take place.
  - The other component is an enclosure that extends over the floor and generally also around it to provide shelter from the weather for human activities.

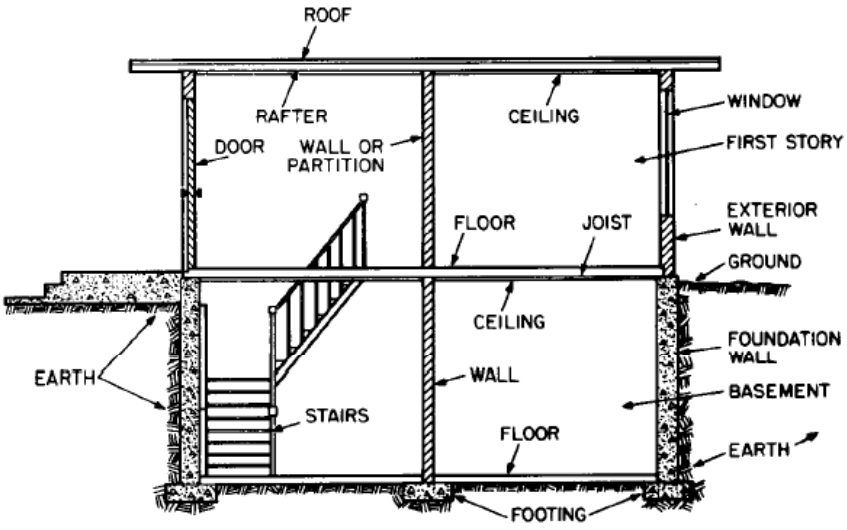


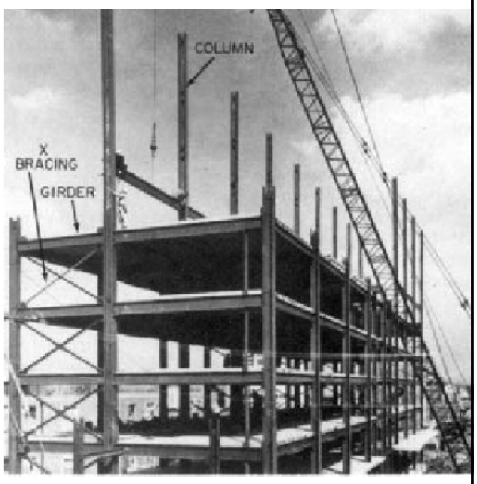
FIGURE 1.1 Vertical section through a one-story building with basement shows location of some major components. *(Reprinted with permission from F. S. Merritt and J. Ambrose,*

Structural System

- The portion of a building that extends above the ground level outside it is called the **superstructure.**
- The portion below the outside ground level is called the **substructure.**
- The parts of the substructure that distribute building loads to the ground are known as **foundations.**

MAJOR BUILDING SYSTEMS

- In most buildings, the superstructure structural system consists of
  - floor and roof decks,
  - horizontal members that support them,
  - and vertical members that support the other components.



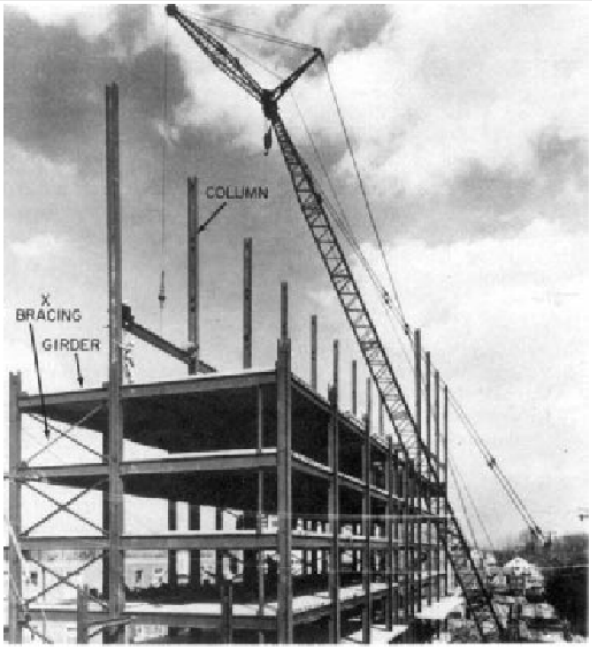


FIGURE 1.3 Structural-steel skeleton framing for a multistory building. (*Courtesy of the American Institute of Steel Construction.*)