

Chapter 1

Introduction

1-1 THE CONSTRUCTION INDUSTRY

- construction contracting is a very competitive business with a high rate of bankruptcy.
- construction is extremely important, it is also essential that construction professionals have knowledge of the business and management aspects of the profession.

Construction Contractors

- *Construction contractors* (or simply *contractors*) are companies and individuals engaged in the business of construction
- There are two types of contractors:
 - General Contractor
 - Specialist Contractor

General Contractors

- They engage in a wide range of construction activities and **execute most** of construction projects.
- When they enter into a contract with an owner to provide complete construction services, they are called *prime contractors*.

Specialty Contractors

- *Specialist Contractors* limit their activities to one or more construction specialties, such as:
 - electrical work, plumbing, heating and ventilating HVAC, or earthmoving.
- They are referred as *subcontractors*
 - Because they are operating under subcontracts between themselves and the prime contractor.

Subcontractors and General Contractors

The terms "subcontractor" and "prime contractor" are **defined by the contract arrangement involved**, not by the work classification of the contractors themselves.

a specialty contractor employed by an owner to carry out a particular project might employ a general contractor to execute parts of the project.

In this situation:

- the specialty contractor becomes the prime contractor for the project and
- the general contractor becomes a subcontractor.

Construction Industry Divisions

- The major divisions of the construction industry consist of:
 - building construction ("vertical construction")
 - residential and nonresidential
 - heavy construction ("horizontal construction").
 - highways, airports, railroads, bridges, canals, harbors, dams, and other major public works.

Other specialty divisions

- Other specialty divisions of the construction industry sometimes used include:
 - industrial construction,
 - process plant construction,
 - marine construction, and
 - utility construction.

1-2 THE CONSTRUCTION PROCESS

- **Project Development and Contract Procedures**
- **How Construction Is Accomplished**

Project Development and Contract Procedures

The major steps in the construction contracting process include:

- bid solicitation,
- bid preparation,
- bid submission,
- contract award, and
- contract administration.

Project Development and Contract Procedures

- For **major projects**:
 1. Recognition of the need for the project (justification).
 2. Determination of the technical and financial feasibility of the project.
 3. Preparation of detailed plans, specifications, and cost estimates for the project.
 4. Approval by regulatory agencies. This involves ascertaining compliance with:
 - zoning regulations,
 - building codes,
 - Civil defense (Fire fighting system and evacuation) and
 - environmental and other regulations.

Project Development and Contract Procedures

- For small projects:
 - many of previous steps may be accomplished on a very informal basis.
- For large or complex projects:
 - this process may require years to complete.

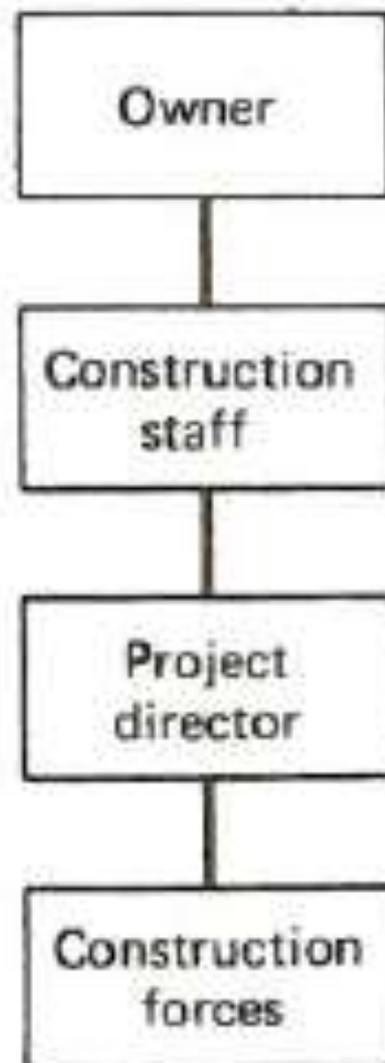
How Construction Is Accomplished (Project Organization Structure)

- The principal methods by which facilities are constructed are as follows:
 1. Construction employing an owner construction force.
 2. Owner management of construction.
 3. Construction by a general contractor.
 4. Construction using a design/build (turnkey) contract.
 5. Construction utilizing a construction management contract.

1. Construction employing an owner construction force.

- Many large industrial organizations, as well as a number of governmental agencies, possess their own construction forces. (Figure 1-5)
- these forces are utilized primarily for performing repair, maintenance, and alteration work,
- they are often capable of undertaking new construction projects.

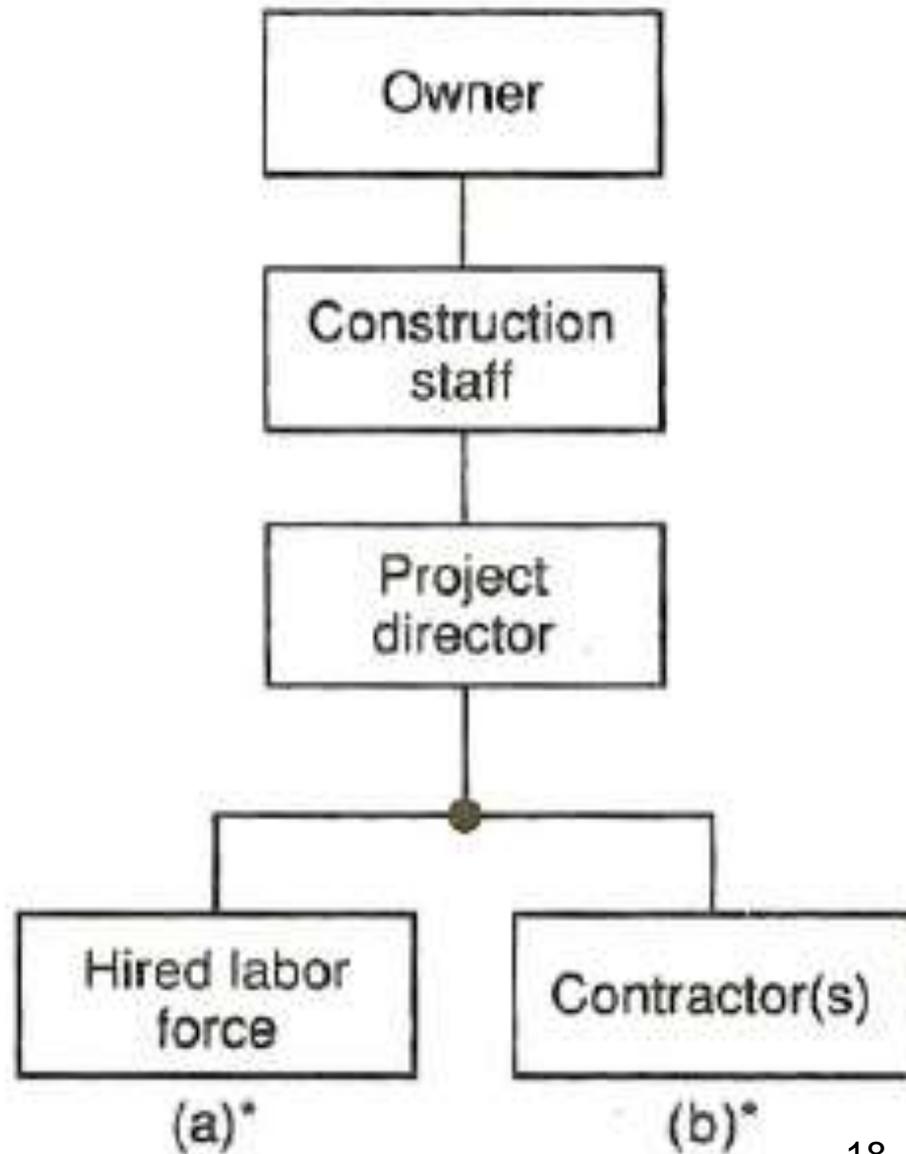
FIGURE 1-5 Construction employing owner construction forces.



2. Owner management of construction

- More frequently, owners utilize their construction staffs to manage their new construction (Figure 1-6).
- The work may be carried out by:
 - workers hired directly by the owner (force account),
 - by specialty contractors, or
 - by a combination of these two methods

FIGURE 1-6 Owner-managed construction. [Either (a) or (b) or both may be employed.]



3. Construction by a general contractor.

- Construction by a general contractor operating under a prime contract is probably the most common method of having a facility constructed (Figure 1-7).
- However, two newer methods of obtaining construction services are finding increasing use:
 - design/build (or turnkey) construction and
 - construction utilizing a construction management contract.

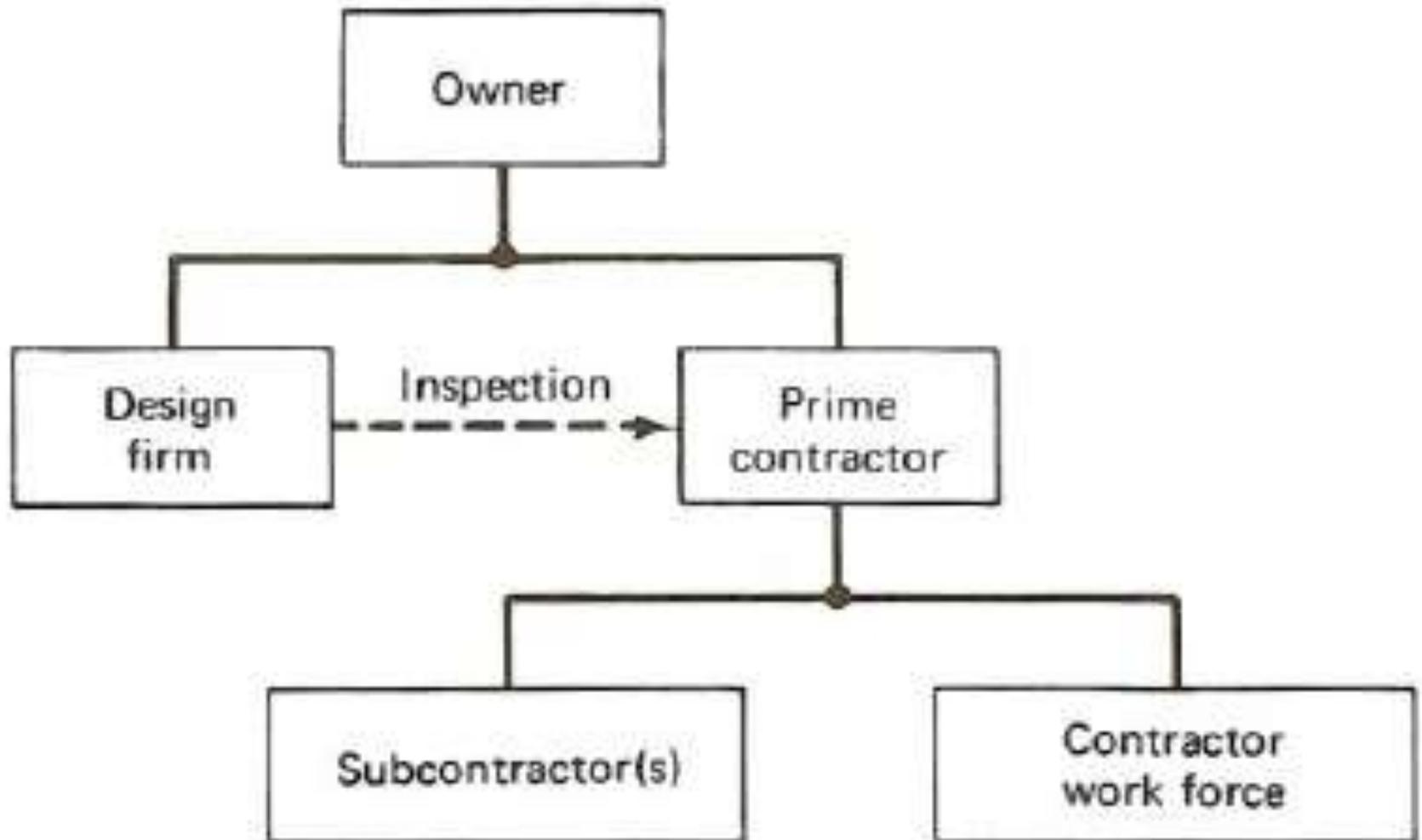
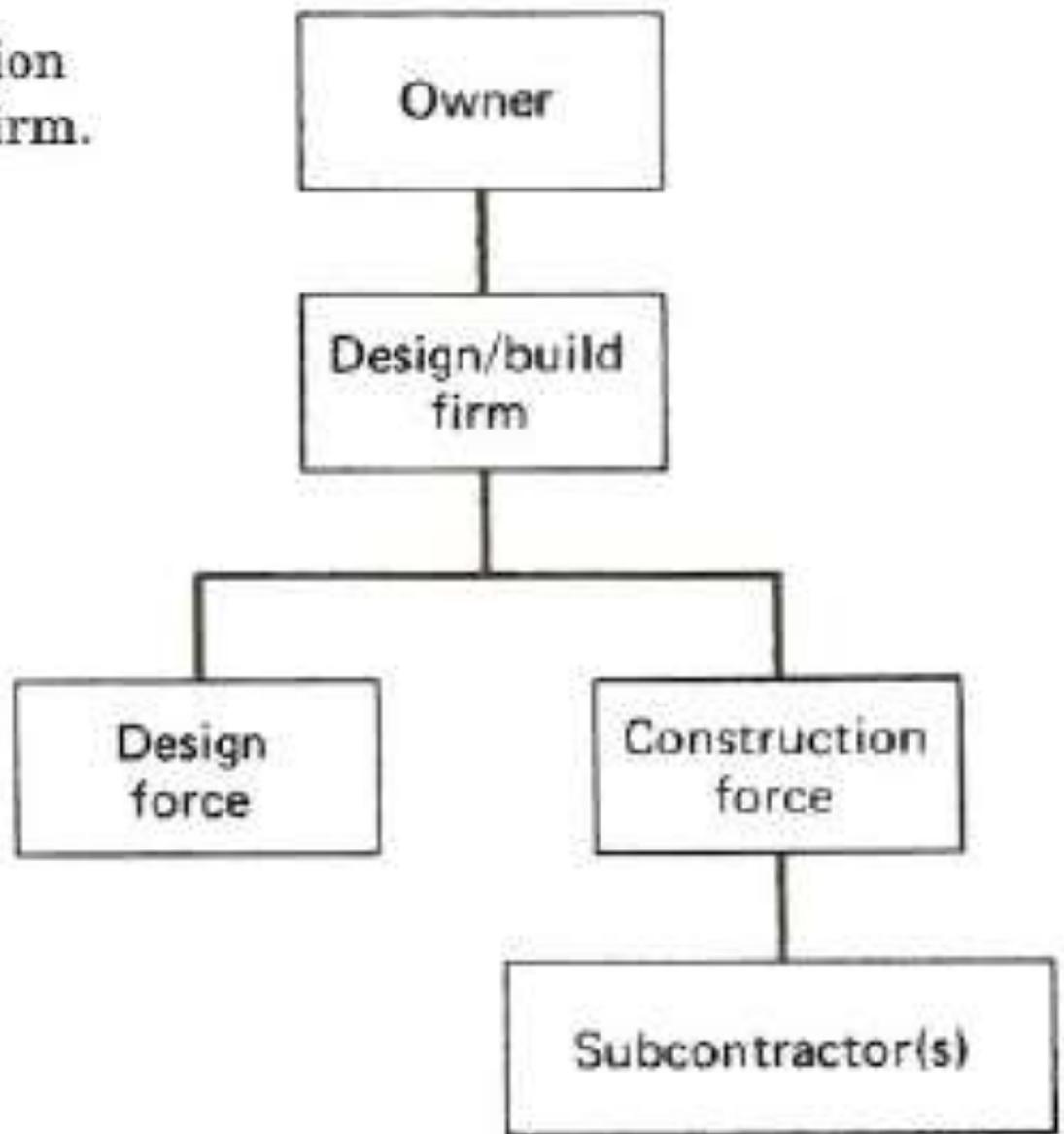


FIGURE 1-7 Construction by a general contractor.

4. Construction using a design/build (turnkey) contract

- an owner contracts with a firm to both design and build a facility meeting certain specified (usually, performance-oriented) requirements. (Figure 1-8),
- Such contracts are frequently utilized by construction firms that specialized in a particular type of construction and possess standard designs which they modify to suit the owner's needs.

FIGURE 1-8 Construction employing a design/build firm.



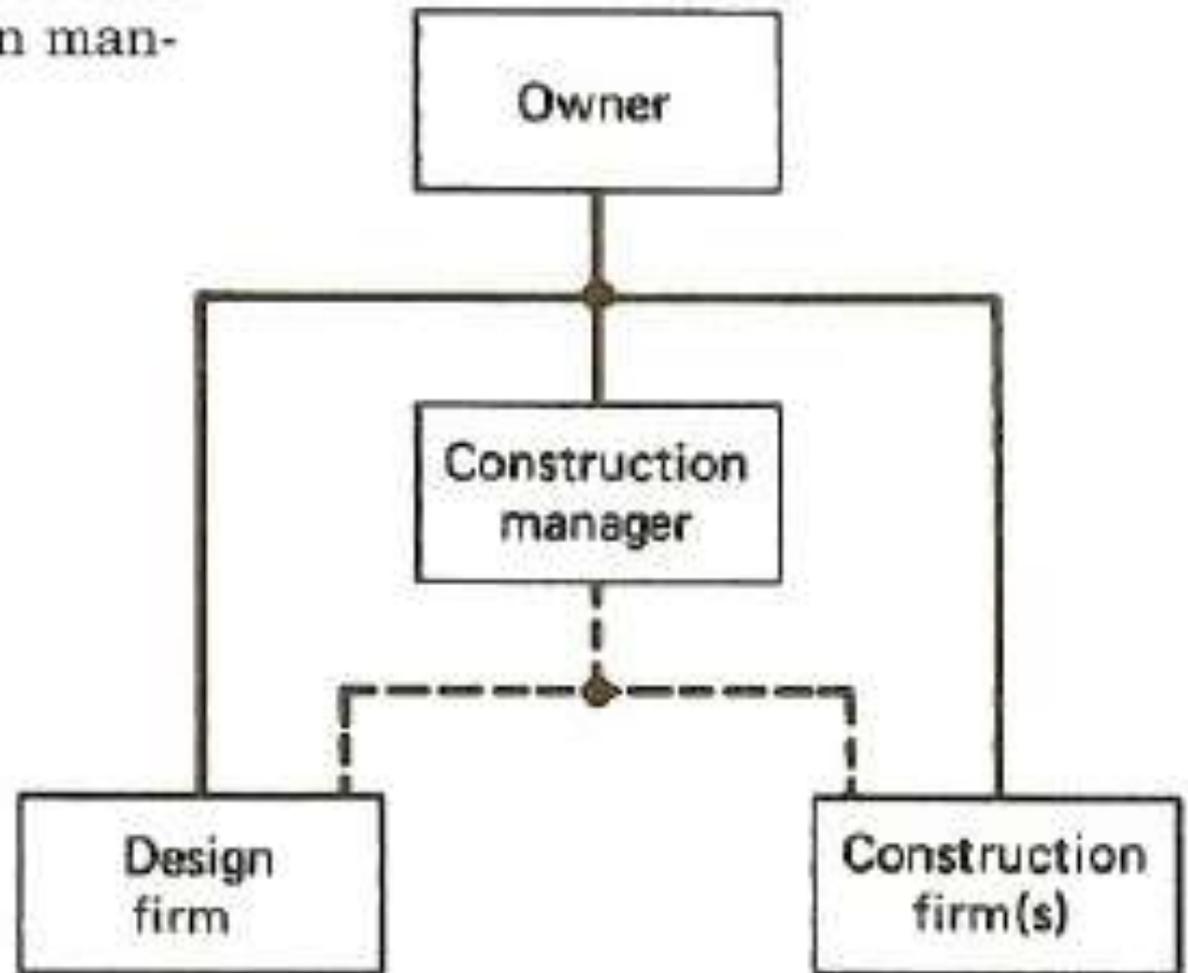
- Since the same organization is both designing and building the facility,
 - coordination problems are minimized and
 - construction can begin before completion of final design.

- Under conventional construction procedures it is also possible to begin construction before design has been completed.
 - In this case, the construction contract is normally on a cost-reimbursement basis.
 - This type of construction is referred to as *fast-track* construction.
- The major disadvantages of the design/build concept are:
 - the difficulty of obtaining competition between suppliers and
 - the complexity of evaluating their proposals.

5. Construction utilizing a construction management contract

- Also known as Agency Construction Management,
- a professional *construction manager* (CM) acts as the owner's agent to direct both the design and construction of a facility.
- **Three separate contracts** are awarded by the owner for design, construction, and construction management of the project.

FIGURE 1-9 Construction utilizing a construction management contract.



- Contractual relation
- - - Management relation (owner's agent)

- CM Offers potential savings in both time and cost.
- Disadvantage:
 - the construction manager (CM) typically assumes little or no financial responsibility for the project. Therefore, the cost of his/her services may outweigh any savings resulting from improved coordination between design and construction.

- There is another, less common form of construction management contract known as Guaranteed Maximum Price Construction Management.
- Under this arrangement,
 - the construction manager guarantees that the project cost will not exceed a specified amount.
 - the construction contract is normally held by the construction manager because of sharing Risk.

1-3 CODES AND REGULATIONS

- United States governmental regulations for Construction:
 - A. Building codes,
 - B. Zoning regulations, and
 - C. Environmental regulations.

- *A. Building codes* : concerned with public safety which provide minimum design and construction standards for structural and fire safety.
- *B. Zoning regulations*: control land use, limit the size, type, and density of structures (commercial, residential, industrial)

C. Environmental regulations:

protect the public and environment by controlling such factors as:

- water usage,
- vehicular traffic,
- precipitation runoff, (rain water creek)
- waste disposal, and
- preservation of beaches and wetlands.

1-4 STATE OF THE INDUSTRY

- **Construction Productivity**
 - It will be covered in Chapter 20.
- **Reducing Construction Costs**

Reducing Construction Costs

- Design Phase: standard material and sizes,
- Construction Phase:
 1. Good work planning (availability of labor, material and tools).
 2. Careful selection and training of workers and managers.
 3. Efficient scheduling of labor, materials, and equipment.
 4. Proper organization of work.
 5. Use of laborsaving techniques such as prefabrication and preassembly.
 6. Minimizing rework through timely quality control.
 7. Preventing accidents through good safety procedures.

1-5 CONSTRUCTION MANAGEMENT

- **Construction Management**
- **Quality control**
- **Reasons for Construction Company Failure**

Elements of Construction Management

- important responsibilities for every construction manager include:
 - workers and subcontractors,
 - equipment and construction plant,
 - material,
 - money (income, expenditure, and cash flow), and
 - time.

- Skillful construction management results in project completion on time, within budget, and as specified.
- Other important responsibilities for every construction manager could be:
 - safety,
 - worker morale,
 - public and professional relations,
 - productivity improvement,
 - Innovation.

Quality Management

- Steps must be taken to ensure that the constructed project meets the requirements established by the designer in the project plans and specifications.

Quality Management (QM)

- *Quality Management* (QM) includes such activities as:
 - specification development,
 - process control,
 - product acceptance,
 - laboratory and technician certification,
 - training, and communication.

Quality Control (QC),

- It is a part of the *Quality Management* process,
- It is primarily concerned with the process control function.
- *Quality Control* is most effective when performed by the contractor.
 - Since the contractor has the greatest control over the construction process.
- the construction contractor is primarily responsible for construction quality.

Quality Assurance (QA)

- It is inspections and tests performed by an owner's representative or government agency provide little more than spot checks
 - to verify that some particular aspect of the project meets minimum standards.

Reasons for Construction Company Failure

- Some major factors are:
 1. lack of capital,
 2. poor cost estimating,
 3. inadequate cost accounting, and
 4. lack of general management ability.