

Construction Management

Fourth Edition

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Summary of Review Questions and Exercises

Solution to Selected Exercises

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Chapter 1

History and Basic Concepts

1.1 Look up the names of the largest contractors reported by ENR in its three main categories: Heavy and highway, nonresidential building, and multiunit housing. Notice that the list also includes their ranking for the previous years. Were they the largest the previous year?

1.2 There have been many construction marvels in human history, of which this chapter only mentioned a few. Comment on three historical projects of your choosing not included here. Examples include the Great Wall of China, the pyramids, the Suez canal, the Eiffel tower, and the Golden Gate bridge, among many others. Why were they built? What makes them unique? How were they built? Who paid for them?

1.3 What advantages do you see in consolidating the roles of owner, designer and constructor shown in Figure 1.10? What disadvantages could it have?

1.4 Give examples of the management levels in construction shown in Figure 1.12.

Chapter 2

Preparing the Bid Package

2.1 What are the three major types of construction bonds? Why are they required? Name three items that affect bonding capacity.

- 1) Bid Bonds: Three party instrument that protects one party from default on the part of a second party.
- 2) Performance Bonds: Issued to a contractor to guarantee an owner that the contract work will be completed and that it will comply with project specifications.
- 3) Payment Bonds: Issued to guarantee the owner freedom from any liens against his completed project.

Three items that affect bonding capacity:

Status of costs, payments, and disputes associated with uncompleted work.

2.2 In what major section of the contract is the time duration of the project normally specified?

It is normally specified in the supplementary conditions.

2.3 Who are the three basic parties involved in any construction bonding arrangement?

1. Obligee (owner)
2. Principal (contractor)
3. Surety (bonding company)

2.4 What type of bond guarantees that if a contractor goes broke on a project the surety will pay the necessary amount to complete the job?

The *performance bond* is centered on these issues.

2.5 What is the purpose of the following documents in a construction contract?

- a. General conditions
- b. Special conditions
- c. Addenda
- d. Technical specifications

a) General Conditions: All the stipulations regarding how a contract is to be administered and the relationships between the parties involved.

Special Conditions: To specify those aspects of the contractual relationships that are peculiar or unique to a given project (duration of the project, instructions on commencement of work, owner-procured materials, format to report progress, etc.)

c) Addenda: To incorporate in a bid package changes in detail, additions, corrections, and contract conditions that arise before bids are opened and that are also basis for bidding.

d) Technical Specifications: To provide a written description of the technical requirements of the work to be performed.

2.6 Why is the contractor normally required to submit a bid bond when making a proposal to an owner on a competitively bid contract?

To insure that the client is protected from default on the part of the contractor in formally entering into contract if given the contract award.

2.7 What is the Miller Act and what does it specify regarding government contracts?

The Miller Act establishes the level of bonding required for federally funded projects. Performance bonds must cover 100% of the contract amount while payment bonds are required based on the following sliding scale: 50% if the contract is \$1,000,000 or less; 40% if the contract is between \$1,000,000 and \$5,000,000; and a fixed amount of \$2,500,000 if the contract is greater than \$5,000,000.

2.8 What is the purpose of the notice to bidders?

The notice to bidders is a solicitation on behalf of the client asking contractors to consider the project advertised for possible bid. It provides information regarding the procedure for submitting a bid for consideration and typically gives information as to where and how the plans and specifications are available for review.

2.9 List the various specialty groups that are normally involved in the design of a high-rise building project.

Main disciplines: Architectural, Civil and Structural, Mechanical, and Electrical

2.10 How much money is the contractor investing in an advertised project available for bid at the time of:

- a. Going to the architect/engineer's office or checking the web to look at the plans and specifications?
- b. Deciding to acquire a set of the drawings for further consideration?
- c. Deciding to make initial quantity take-off?
- d. Full preparation of bid for submittal?

a) Cost of transportation to and from architect's office plus time involved in reviewing the plans and specifications.

b) Cost of purchasing or placing a refundable deposit on the plans and supporting documents for review.

c) Hourly cost for time and materials invested by estimating personnel to develop or check quantities of work to be performed.

d) The rule of thumb (which must be interpreted and modified up or down based on the type of project) is 1/4 of a percent of the bid amount (e.g. if \$10,000,000 is bid, the cost of bidding will be 0.0025 (10,000,000) or \$25,000.)

2.11 What are the major parameters to be considered in the prequalification assessment of a contractor? Investigate the local criteria used in the pre-qualification of both small housing and general contractors.

Among other factors:

- Firm's expertise and capability in accomplishing similar types of construction.
- Financial capacity of the firm.
- The quality and number of personnel available from the firm for the project of interest.

2.12 Obtain sample specification clauses relating to the quality of finish of an item such as face brick, exterior concrete, or paint surfaces. Who has the major responsibility for the definition, achievement in the field, and paid acceptance?

2.13 Read those clauses of the general conditions of the contract for construction that refer to the owner, architect, contractor, and subcontractor. Then list the major responsibilities of these agents with respect to the following:

- a. The definition, or attention to, the scope of the project
- b. The financial transactions on the project
- c. The finished quality of the work

2.14 Look up the percentage of the total cost of a building that RS Means Building Construction Costs™ estimates for its architectural design.

2.15 An architect asks \$100,000 for the architectural design of a new building. However, after the preliminary design is completed, the owner and the architect decide to stop the design process. How much of the \$100,000 would it be fair to pay to the architect? Why? Ask an experienced contractor to comment on your answer. Do not consider any legal aspects that would complicate your answer.

2.16 Visit the McGraw-Hill Dodge Construction Reports™ website (<http://dodge.construction.com>) and find the three largest projects currently being bid in your state in the categories of engineering, commercial, houses and utilities. Report the provided general description (“type”), estimated cost (“valuation”) and their owner.

2.17 The American Institute of Architects (AIA) has standard contract documents similar to the ones provided in the Appendixes of this book, developed by the Engineers Joint Contract Document Committee (EJCDC). What differences in the content of their respective General Conditions would you expect to find? Discuss at least five of the topics shown in Table 2.1.

2.18 The blueprints for a 12-story condominium project indicate that it will utilize high-performance engineered wood joists. The specifications, however, indicate that the joists will consist of cheaper, traditional TJIs. Which of the two items would have priority, if the mistake is not detected prior to awarding the construction contract?

Chapter 3

Issues During Construction Phase

3.1 What is the difference between liquidated damages and a penalty for late completion of the contract?

Liquidated damages are an estimation of the loss that the owner is incurring by not having the project in operation. The contractor has to pay this amount to the owner for every day the project is not operating. A penalty is an amount of money usually higher than the liquidated damages and estimated without any link to actual damages incurred by the owner. Legal precedent establishes that the same amount established in the penalty has to be paid to the contractor as a bonus if the contractor finishes the project earlier than the established date.

3.2 What is the purpose of retainage?

3.3 During what period can a contractor withdraw the bid without penalty?

It can be withdrawn prior to bid opening.

3.4 As a contractor you have built a 100-unit apartment complex that rents for \$450 per unit a month. For late completion you were assessed \$2000 per day. Would you qualify the assessment as liquidated damages or as a penalty? If the contract had included a bonus of \$500 per day for early completion, would you expect to gain any assessment from court action? Why?

3.5 Describe the procedures to be followed for the receiving and opening of bids. If possible attend a bid opening and determine the number of bids that were submitted. For several unsuccessful bids determine the dollar amounts by which they exceeded the winning bid. Then calculate (relative to the winning bid) the percentages by which they exceed the winning bid. What do these figures tell about the strength of the current estimating and market environments? How much did the winning bidder "leave on the table"?

Procedures to be followed for the receiving and opening of bids:

1. Issuance of the notice to bidders
2. Bid opening
3. Award of contract/Notice to proceed
4. Signing of a contract agreement

3.6 Scan a typical stipulated sum contract and identify those clauses that prescribe, modify, or are related to time considerations. Then develop a time strip map (similar to Figure 3.1) for the contract that locates the times (or time zones) for which each of the clauses are relevant. Which clauses rigorously fix time constraints for the contract and which are dependent on acts of God or the owner for relevance?

3.7 Describe the procedure to be followed by the contractor who wishes to claim a time extension. What sort of documentation do you think is necessary to either refute or defend a time extension claim due to unusual weather? What sort of records do local contractors keep of weather conditions?

If the contractor is seeking a time extension, he or she will send a written request for additional time citing the basis for the request (e.g. exceptionally bad weather, etc.) to the client or the client's representative. Job logs citing the nature of events (e.g. strikes at a suppliers organization) or weather which the contractor could not have anticipated are used to document the basis for a time extension. Hard copy daily logs are typically maintained at the site. In some cases, visual documentation may be available in the form of photographs and videotape records

3.8 Must a contractor accept and perform all the work involved in each contract change order? Is there a limit to the number or magnitude of change orders that can be applied to a contract? When can a contractor refuse to accept a change order?

Typically the contractor has priority in performing work required by a change order. The contractor will estimate the work and submit a bid to accomplish the required change. The General Conditions typically establish the procedure. In some cases, the owner may decide that the contractor bid for the change is unacceptable and decide to bid the work as a totally separate contract (i.e. not part of the existing contract) with another contractor. Typically there is no limit to the number of change orders which can be issued. The contractor must proceed with executing a change order from the client.

3.9 List the common causes of changed conditions in a building contract. What typical contract clauses bear on the problems caused by changed conditions? Suppose separate contracts are let for the building foundations and all remaining work. If you are the second contractor and you find that the foundations are incorrectly located, either in plan or elevation, would you be able to claim a changed condition?\

Typical clauses addressing these issues are:

1. Soil conditions
2. Presence of water

3.10 Prepare a punch list of deficiencies or repairs that you consider necessary for your room, garage, or classroom. Can any of these items be related back to the original acceptance of the facility?

3.11 How would you go about either documenting a claim for a contractor's progress payment or its verification by the contract administrator for a typical building project in your locality?

Documentation of a progress payment claim or request typically requires development of quantities placed. This may include survey data developed by a site survey team, documents from vendors indicating receipt and installation of material, invoices from subcontractors, and the like. If the contract is a lump or stipulated sum contract, then the quantities documented must be converted to a % complete of the total project. This assessment of % complete or % of work placed must be agreed to by both parties (i.e. client and contractor). If, for instance, it is agreed that quantities placed support the fact that the total job is 45% complete, and the previous month's % complete was 37%, then the assumption is that 8% of the total bid has been earned in the month of interest

3.12 Fudd Associates, Inc. submits a bid for \$20,000,000. Mr. Fudd discovers at bid opening that all other bids are over \$25,000,000. It is obvious that there is a mistake in his cost estimate. Could he withdraw his bid after all bids are opened, but no winner has been declared? Why? What circumstances would make you change your answer?

3.13 A contractor signs a contract for the construction of a \$150 million ship harbor expansion. Before the Notice to Proceed is issued, a hurricane passes near the area and substantially changes the shape of the sea floor. The contractor claims that different drilling and dragging equipment will be required for the changed shape, and requests a bid price adjustment. The owner responds that the passing of a hurricane is common in the area, and therefore, the contractor should have included the event as a contingency cost in his bid. Who is right? How do you think that this real case was settled?

3.14 Alright Construction, Inc. signs a contract with Casa Del Monte, Inc. to build five new 20-room modules for a large tourist resort in a Caribbean country. Casa Del Monte establishes liquidated damages of \$30,000 for each day over the contractual deadline of December 1. The damages are considered reasonable, based on a net income of \$300 for each of the 100 new rooms. However, political instability in the country keeps tourists off the resort. It has an occupancy rate of just 20% during December. Alright Construction does have a delay of 15 days. Can this contractor claim that the liquidated damages are excessive, and should be limited to $20\% \times \$30,000 = \$6,000$ per day?

Chapter 4

Construction Contracts

4.1 Name and briefly describe each of the two basic types of competitively bid construction contracts. Which type would be most likely used for building the piers to support a large suspension bridge? Why?

- a) Lump Sum – A quotation of total cost is given to the owner for the cost of the work based on plans and specifications provided. If accepted by the owner, this becomes the "fixed price" for the work and does not vary unless change orders are issued which have cost implications.
 - 1. Advantage to owner – knows expected total cost of work before work commences.
 - 2. Disadvantage to owner – plans and specifications must be totally prepared before selecting a contractor. Also referred to as "stipulated sum" type of contract.
- b) Unit Price – A bid schedule of the items to be constructed is prepared and given to potential contractors. The contractor quotes prices for each work item based on the unit associated with each item in the bid schedule. Concrete work items, for instance, might have the associated "unit" of cubic yards. The contractor's price for concrete items would be quoted in \$/cubic yard. This is somewhat like a grocer giving prices for apples and oranges. The total amount paid to the contractor is based on the actual number of work item units placed times the unit cost. Since quantities are measured in the field and may vary from the original guide quantities given with each work item, the actual final cost to the owner is not known until all work is placed and the final quantities are measured. To a certain degree, the contractor's risk is reduced since he will be reimbursed at his quoted price for all units placed.

The unit price type contract would be best for contracting for the construction of bridge piers since a large number of variable and unknown factors are involved (e.g. sub-surface conditions, etc.) which may cause quantities to vary significantly.

4.2 If you were asked to perform an excavation contract competitively with limited boring data, what type of contract would you want and why?

The most appropriate contract would be Unit Price, because of the unknown factors

4.3 Name three ways the construction contract can be terminated.

- a) Mutual Agreement
- b) Successful completion
- c) Default (either side)