

Guide to Passing the Civil PE Exam Construction AM

Edition 2

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TOPIC I: Project Planning

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TOPIC I: Project Planning

Introduction

The Project Planning section is the first main category listed on the NCEES outline for the Civil Breadth Exam (AM Portion). There are four subcategories that are **MUST KNOW** for this section. There is approximately 4 questions that are going to be on the exam from this section, so it can be assumed that 1 question from each topic will be asked. This area of the exam will test your ability to read the information, interpret the information correctly, and to execute the correct calculation. One mistake in that three step process will result in an incorrect answer.

The section is very broad and does encompass an incredible amount of information. I truly believe the key for success for this section is to be able to understand the theory behind the subject matter and then solve a lot of practice problems. If you do that, in the actual test you will be able to quickly rationalize and work through any of these problems with confidence. They are not hard but little mistakes can and will hurt you on this section.

Below are the subcategories within this topic.

- A. Quantity take-off methods
- B. Cost Estimating
- C. Project Schedules
- D. Activity identification and sequencing

As you can see from the topics this section covers material/cost estimating and scheduling. The AM portion will not be as detailed as you need for the PM section. However, you better know the basics about both sections. The problems will not be difficult but if you rush to fast, you could make a simple mistake

1 Quantity Take-off Methods

Introduction

Quantity Take-off Methods is the art of deriving the required quantities of construction materials necessary for building a construction project. There are many methods, many schools of thought, and many different approaches to performing quantity take-offs. However, the methods I'm going to illustrate here are the methods that are generally accepted throughout the country and will typically bring you within range of developing a correct answer.

A word of caution: if you have estimated in your career or are currently an estimator, the methods you may have learned for quick and easy calculations will usually yield an incorrect answer.

Discussion

Below is the only strategy you need for Quantity Take-Off. It is really that easy!

1. Review the Drawings and Specifications.
2. Have a mental image of what the problem statement is asking you.
3. Measure quantities of work to be performed in appropriate units.
4. Double check units to minimize errors.

Here are the most common mistakes in the Quantity Take-Off

1. Arithmetic Errors.
2. Errors of omission.
3. Unrealistic waste of loss factors (never apply a waste factor unless explicitly stated to do so).
4. Rounding down if the quantity came out to a decimal.
5. Omitting the "zero" position during a count.
 - a. Counting fence posts is a classic example of this; i.e., how many fence posts are required for a 500' long fence that requires fence posts every 5' OC?

Classic Mistake = $(500' \text{ Fence} / 5' \text{ OC Posts}) = 100 \text{ Posts}$, right?...Wrong!

Correct Method = $(500' \text{ Fence} / 5' \text{ OC Posts}) = 100 \text{ Posts} + 1$ at the start of the fence run. Therefore total fence posts will require 101 Posts.

The most likely material that you will have to perform during the test is below;

- 1.** Volume of Concrete (CY)
- 2.** Pounds of Rebar for concrete (LBS)
- 3.** Pounds of Steel in beams (LBS)
- 4.** Square Foot of Contact Area required for Formwork (SFCA)
- 5.** Square Foot of Roofing Materials (SF)
- 6.** Board Feet of Lumber (BF)
- 7.** Sheets of plywood (SHTS)
- 8.** Tons of Asphalt for Roadway (TN)
- 9.** Number of Bricks for a Wall (EA)

For all of the typical quantities for the Quantity Take-Off Methods, I believe the most common mistakes are the mental errors when performing the calculations. You are working under timed circumstances, pressure, and you will typically not be as “neat” as you would normally be in a regular working environment. Because of this, I strongly recommend making calculations in a table format as much as possible to keep your numbers in order.

Quantity take-off methods Example Problems

Question #1: Board Foot

If there are 63 Ea – 12 in x 12 in Posts, and each being 18 linear feet long. What is the BF Calculation?

Solution #1:

12x12 Posts	Quantity	H (IN)	W (IN)	Length	Total Length	Total IN ^3	Total BF
12x12 Posts		12.00	12.00	18.00 ft	216 in	31, 104	216 BF
Total	63.00 EA						13,608.00 BF

Quantity take-off methods: Other Reference Material and Problems

Reference material

Problems

1. NCEES 2014 PM Problem 507
2. NCEES 2014 AM Problem 101

2 Cost Estimating

Introduction

Now that you can quantify construction materials as discussed in the previous section, you should be able easily develop an accurate cost estimate for installing the construction materials using some given labor and equipment prices.

Developing an accurate cost estimate to install construction materials would not be possible labor and equipment prices are not known. For an experienced estimator, they may be able to provide a order of magnitude estimate but a real estimate would not be achievable. For example, what would be the total cost to install a 2500 LF of 24” Ductile Iron Pipe in Southern California? This question cannot be answered because you don’t know what the labor rates are or the price of material per LF. For the exam this missing information will have to be given to you. So all you need to do is understand a few terms and concepts and you should be able to ace this section. Remember simple mistakes cause people to miss problems here. So double check your work. This is fundamental concept behind Cost Estimating.

Discussion

Steps for Cost estimating

Material Costs

1. Materials Estimates: This is the quantity take off step that was already discussed in an earlier section
2. Calculate Material Costs: So here you just need to multiply the quantity by the cost per unit.

Equipment Costs

3. Equipment Estimates: To figure out this section you might have to understand equipment production rates to calculate the amount of time you will need the equipment. These estimates are in a different study section that I will later show you. So for now let assume they will give you the equipment production rate to do the jobs and the cost of the equipment. You may have to multiply an efficiency factor to increase or decrease the production rate if it is given.
4. Calculate Equipment Costs: Multiple the equipment cost/day by the number of days required to do the work.