

# CHAPTER 24

## ACTIVITY BASED COSTING

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### 1. INTRODUCTION

Activity Based Costing (ABC) is a method for developing cost estimates in which the project is subdivided into discrete, quantifiable activities or a work unit. The activity must be definable where productivity can be measured in units (e.g., number of samples versus manhours). After the project is broken into its activities, a cost estimate is prepared for each activity. These individual cost estimates will contain all labor, materials, equipment, and subcontracting costs, including overhead, for each activity. Each complete individual estimate is added to the others to obtain an overall estimate. Contingency and escalation can be calculated for each activity or after all the activities have been summed. ABC is a powerful tool, but it is not appropriate for all cost estimates. This chapter outlines the ABC method and discusses applicable uses of ABC.

### 2. ACTIVITY BASED COSTING METHODOLOGY

For many years, construction firms and industry trade groups have collected cost data from a multitude of different construction projects. The amount of work associated with that cost was also collected with the cost data. For example, collected data included the cost of the paint, labor, equipment, and overhead to paint a room, the amount of surface area painted, and the manpower required to paint the room. This practice allowed construction professionals to obtain a cost per area and manpower per area. These costs are based on an activity, such as painting, and are known as ABC. ABCs are discussed in detail in the following sections.

#### A. Activity Based Costing Definition

ABC can be defined by the following equation:

$$C/A = HD + M + E + S$$

where

C/A	=	Estimated cost per activity
H	=	Number of labor hours required to perform the activity one time
D	=	Wages per labor hour
M	=	Material costs required to perform the activity one time
E	=	Equipment costs to perform the activity one time
S	=	Subcontracting costs to perform the activity one time

The total cost for performing the activity will be based on the number of times the activity is performed during a specific time frame.

Cost estimators have assembled large databases of activity based cost information. The R.S. Means Company updates its published cost references on a yearly basis, and they are an excellent source of ABC information for the construction industry.

### **B. Use of Activity Based Costing Methodology**

ABC methodology is used when a project can be divided into defined activities. These activities are at the lowest function level of a project at which costs are tracked and performance is evaluated. Depending on the project organization, the activity may coincide with an element of the work breakdown structure (WBS) or may combine one or more elements of the WBS. However, the activities must be defined so there is no overlap between them. After the activity is defined, the unit of work is established. All costs for the activity are estimated using the unit of work.

The estimates for the units of work can be done by performing detailed estimates, using cost estimating relationships, obtaining outside quotes for equipment, etc. All costs including overhead, profit, and markups should be included in the activity cost.

### **C. Identification of Activities**

When defining an individual activity, the cost estimator must balance the need for accuracy with the amount of time available to prepare the estimate. An estimator may be able to develop an extremely accurate cost estimate by defining smaller and smaller activities; however, the amount of time required to prepare ABC estimates for each of these activities may not justify the increased accuracy. The total estimated project cost may be sufficiently accurate if 10 activities are used instead of 15. On the other hand, reliable cost information may not be accessible if the activity categories are too general. Since the activity is the basis for the estimate, it is very important that the activity be selected correctly.

### **D. Example of an Activity Based Costing Estimate**

To get a better understanding of how an ABC estimate is developed, assume that you have been asked to prepare a cost estimate for a site evaluation. To verify that there is no contamination at the site, subsurface soil samples will have to be collected. The area of the site is known, and the guidelines for the number of samples per unit area has also been given.

1. Site: Atlas Metals (now out of business)

2. Objective: Collect and analyze subsurface soil samples to determine if contamination exists from past usage of the 1,000 square-foot-yard area.
3. Sampling Requirements: One sample per 100 square feet, and sample depth is 5 feet.

The following activities would be involved:

- mobilize equipment and personnel,
- drill hole for sample,
- collect sample,
- decontaminate equipment between samples,
- prepare all samples for analysis,
- demobilize equipment and personnel,
- analyze samples.

Equipment needs are as follows:

- Hand-held auger for sample collection  
(\$100.00/day flat rate)
- Safety equipment for site personnel  
(gloves, safety glasses, and protective equipment at  
\$10.00/person/day)

Material needs are as follows:

- Sampling containers and labels  
(\$1.00/sample)
- Water to clean the auger between samples  
(5 gallons/sample at \$.30/gallon)

The auger requires two people to operate it. Site mobilization and demobilization will take a total of 1 hour. Local labor rate is \$15.00/hour for all disciplines. A 2-person crew can prepare 10 samples for analysis in one hour. The laboratory charges \$1,000.00/sample for analysis.

- Number of hours required to perform the activity = 12 hours
- Wages per labor hour =  $2 \times \$15.00 \times 2.5 = \$75.00/\text{hour}$
- Labor cost per sample =  $(12 \times 75) \div 10 = \$90.00/\text{sample}$
- Materials costs =  $(10 \times \$1.00 + 2 \times (2 \times \$10.00) + 10 \times 5 \times \$0.30) \times 1.2 = \$78.00$
- Materials cost per sample =  $\$7.80/\text{sample}$
- Equipment costs =  $(2 \text{ days} \times \$100.00/\text{day}) \times 1.2 = \$240.00$
- Equipment cost per sample =  $\$24.00/\text{sample}$
- Subcontractor cost per sample =  $(\$1,000.00 \times 1.15) = \$1,150.00$
- $C/A = (HD + M + E + S)/\text{sample}$
- $C/A = \$90.00 + \$7.80 + \$24.00 + \$1,150.00 = \$1,271.80/\text{sample}$

If the area requiring sampling increases or decreases, the number of samples can be recalculated using this ABC.

### **3. APPLICATION OF ACTIVITY BASED COSTING**

As can be seen from the example, ABC can be a useful cost estimating tool for non-conventional and construction projects. However, there are some activities that are more appropriately estimated using other cost estimating techniques. For example, site security may always be required at some facilities regardless of the number of employees at the facility or work being conducted at the facility.

ABC estimating is especially useful in instances where the number of activities is uncertain or may change during the estimate process. Referring back to the ABC estimate example, if the number of samples changed, it would be fairly easy to recalculate the cost of the sampling.