

CLB 029

Labor Estimation Rates

Lesson



Defense Acquisition University

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Rates

Labor Estimation Rates

Introduction

Approximate Length: 45 Minutes

Welcome to the **Labor Estimation Rates** lesson of the **Rates** module. This lesson includes the following topics:

- Intro
- Wrap Rate
- Direct Labor Hours
- Efficiency Rate
- Labor Standard
- Summary

Introduction Scenario

Two contractors are bidding on a 5-year contract to produce 1,400 avionics boards for the U.S. Air Force. Contractor A's wrap rate is \$80. Contractor B's wrap rate is \$85.

Will awarding the contract to Contractor A result in a cost savings for the government? The answer: it depends (at least in part) on the contractors' **efficiency rates**.

The **Labor Estimation Rates** lesson begins by defining **wrap rate** and its components.

The rest of the lesson is devoted to explaining an underlying factor of the wrap rate, **direct labor hours**, and another important estimating factor, the **efficiency rate**.



If you are involved in assessing or estimating contract costs, then you need a solid understanding of wrap rate, direct labor hours, and efficiency rate; and you need to know how to apply the efficiency rate to calculate **realistic** labor hour estimations.

Learning Objectives

Upon completion of this lesson you will be able to:

- Define wrap rate.
- Define direct labor hours.
- Estimate the actual time it will take a contractor to complete a task, given the efficiency rate and standard hours.
- Contrast standard hour and labor standard.



Wrap Rate

As a cost analyst, **wrap rate** is a term you will encounter and use frequently. Another common name for the wrap rate is the **fully burdened labor rate (FBLR)**.

The FBLR is called "**fully burdened**" because it attempts to include all the contractor costs necessary to convert the estimated contractor hours to contractor dollars.

The wrap rate typically includes three rates:

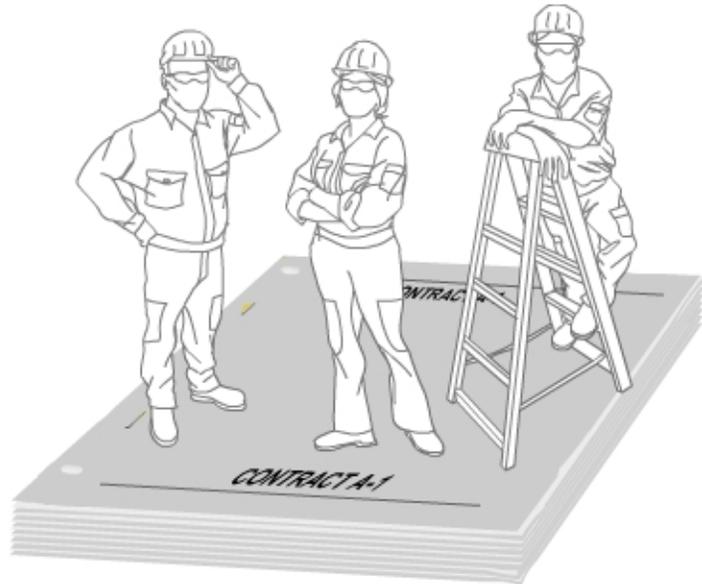
- Direct labor wage rate
- Overhead costs rate
- Other costs rate



Direct Labor

Direct labor hours are hours that can be explicitly attributed to a particular task or work order; or, in government acquisition, to a particular **program or contract**.

The **direct labor wage rate** is the composite hourly wage rate of those employees who can be charged **directly** to a specific program or contract.

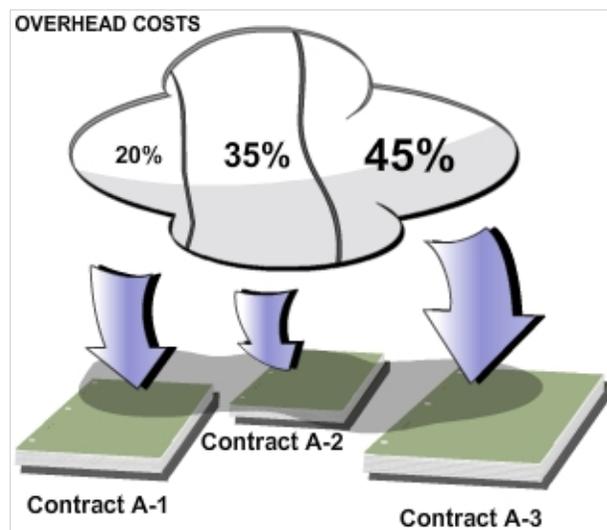


Overhead Cost

Overhead costs, also called **burden**, are **indirect costs** that benefit multiple programs or contracts, and therefore cannot feasibly be charged directly to just one.

Labor costs of personnel who do **not** charge directly to a project or operation—supervisors, inspectors, maintenance workers, custodians, etc.—are usually considered overhead.

In addition, most firms include fixed charges, such as rent, insurance, and depreciation, in their overhead pool.



Firms account for their overhead costs by allocating them, based on applicable **overhead rates**, to the different programs or contracts the overhead costs benefit.

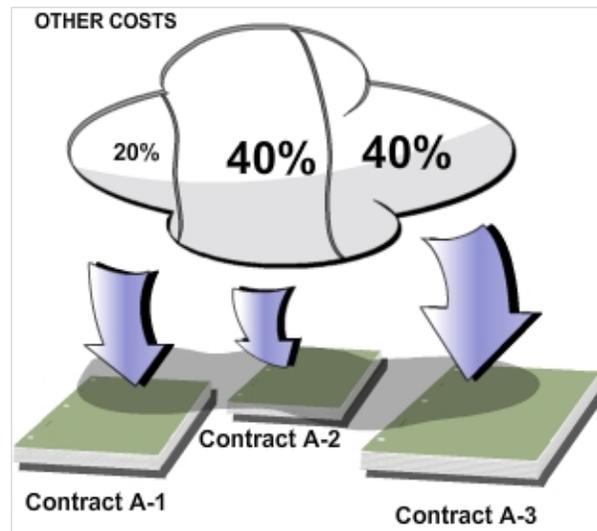
Other Costs

Other costs are any other costs the firm incurs but has **not** accounted for as either direct or overhead costs.

Depending on the type of contract and degree of risk, other costs sometimes include **profit**.

The cost of money and general and administrative costs are also typically included as other costs.

Firms account for their other costs by allocating them, based on applicable **rates**, to the different programs or contracts the other costs benefit.



Sources of Wrap Rates

Sources 1

Where do the labor hours, overhead cost rates, and other cost rates that are included in the wrap rate come from? One way to compile this data is referred to as **detailed, grass-roots, or bottom-up** estimating.

Detailed, grass-roots, or bottom-up estimating involves starting at the bottom—breaking each program down into its sub-activities and estimating the labor hours, material costs, and overhead associated with each sub-activity.



In order to do a bottom-up estimate, you need access to very **detailed data**. As you can imagine, bottom-up estimating is **extremely time consuming**.

Pure bottom-up, grass-roots estimates are therefore rarely, if ever, compiled by the cost analyst. Actual bottom-up estimates of labor, material, engineering, and quality control are normally prepared by the contractors who will do the work or by the industrial engineering component using existing standards.

Sources 2

Contract pricing and the **Defense Contract Audit Agency (DCAA)** develop and evaluate wrap rates.

The government negotiates **forward pricing rate agreements (FPRAs)** with contractors that represent the best estimate as to what the expected wage rates will be during a specified period. FPRAs are used to set the pay standard for a variety of skill sets found within a geographical region.

Costs analysts rely on the FPRAs when evaluating and comparing contractors' proposals. For example, if the FPRAs for a Senior Level IV Computer Programmer in Huntsville, AL is \$200, and a contractor has that skill priced at \$120 in their proposal, then you need to figure out what the contractor overlooked or which requirements they didn't fully understand.

You will obtain the wage rates, overhead rates, and other cost rates from **contract pricing** and the **DCAA**.

On occasion, you may disagree with or find an error in the provided rates, or you may need to extend the wrap rate beyond the time period of the FPRAs contract.

Wrap Rate Application

To illustrate the **fully burdened labor rate (FBLR)**, or **wrap rate**, let's use an example.

Over the next 120 months, Contractor B will spend 160 hours each month supporting a UAV for the U.S. Army at a **direct labor cost** of **\$52.50** per hour.



$120 \text{ months} \times 160 \text{ hours per month} \times \$52.50 =$
\$1,008,000.

Question

Is \$1,008,000 the **fully burdened** labor cost Contractor B will incur?

Answer 1

No—**\$1,008,000** is **not** the fully burdened labor cost Contractor B will incur; this is only the **direct** labor cost.

To calculate the **fully burdened** labor cost, we need to include the **overhead costs** and **other costs** Contractor B will incur.

Contractor B allocates:

- **Overhead costs** at the rate of **150%** of the **wage rate**.
- **Other costs** at the rate of **15%** of the **wage rate** and the **overhead rate**.

Fully Burdened Labor Rate



Given this additional information and your undeniable accounting prowess, can you figure out the FBLR?

Recall that the wage rate is **\$52.50**.

Answer 2

To calculate Contractor B's wrap rate or FBLR:

Wage rate	\$52.50
Overhead rate = $\$52.50 \times 150\%$	78.75
Other cost = $(52.50 + 78.75) \times 15\%$	<u>19.69</u>

FBLR or Wrap Rate **\$150.94**

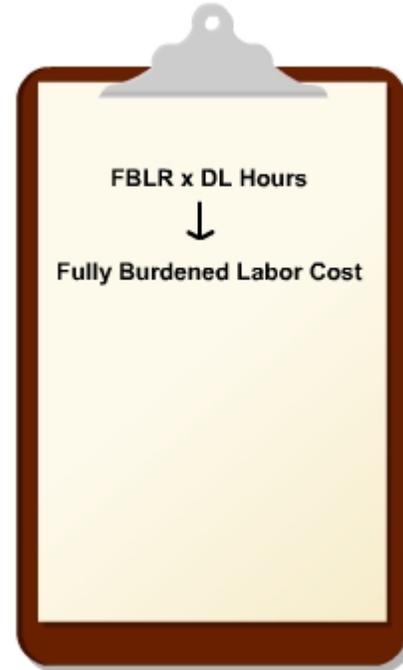
Now, let's do one last calculation to illustrate fully how the FBLR (wrap rate) is applied.

Recall that Contractor B will spend **160 hours** per month over the next **120 months** supporting the UAV. What is Contractor B's **fully burdened** labor cost?

Answer 3

To calculate Contractor B's fully burdened labor cost:

\$150.94 FBLR x 160 hours per month x 120 months =
\$2,898,048 fully burdened labor cost.



Challenge—FBLR

State what FBLR stands for and its definition.

Answer

FBLR stands for **Fully Burdened Labor Rate**. The FBLR is also known as the **wrap rate**.

The wrap rate includes the direct labor wage rate, overhead costs rate, and other costs rate.

The wrap rate is used when assessing contractors' proposals and making cost estimations.

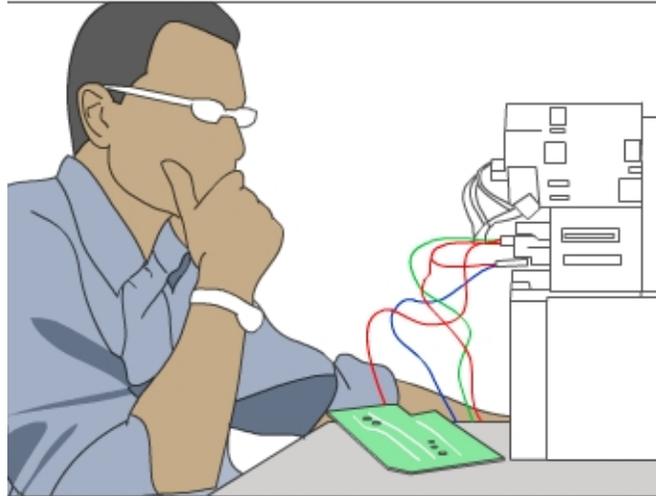
Direct Labor Hours

Direct Labor

Now let's turn our attention to an integral part of the wrap rate: **direct labor hours**.

Most of our cost estimating relationships use **direct labor hours** as a parameter or predict cost in terms of direct labor hours. Therefore it is essential that you understand this term.

Direct labor hours are those hours which can be explicitly attributed to a particular task, work order, contract, or program. At the lowest level of direct labor estimation, we would estimate the effort required to produce a given part.



Direct labor costs are typically segregated into two major categories:

- Engineering
- Manufacturing

Engineering

Engineering includes the activities involved in researching and designing products and production processes. Normally the majority of engineering activity is classified as direct labor cost. The following are examples of engineering activities:

Design engineering—Design engineering involves delineating the characteristics and specifications of the end product.

Manufacturing engineering—Manufacturing engineering involves planning the manufacturing process, developing process instructions and work methods, shop loading, organizing work stations, and matching shop capabilities to contractual requirements.

Reliability and maintainability engineering—Reliability and maintainability engineering involves designing and manufacturing products to meet longevity and repair requirements.

Quality assurance engineering—Quality assurance engineering involves the formulation of standards and specifications for tests and inspections.

Sustaining engineering—Sustaining engineering involves as needed support as problems arise throughout the life of the contract.

Manufacturing

Manufacturing labor is the hands-on effort to product a product. The following are examples of manufacturing activities:

Fabrication—Fabrication involves the fashioning of parts from raw materials or purchased materials.

Assembly—Assembly involves the effort to combine parts into subassemblies and assemblies.

Quality control—Quality control involves the act of testing or inspecting the product during the manufacturing process and prior to final acceptance.

Efficiency Rate

Standard Hours

Now that you understand what **direct labor** is, let's examine a useful tool you can use to assess and estimate contractors' direct labor hours—the **efficiency rate**.

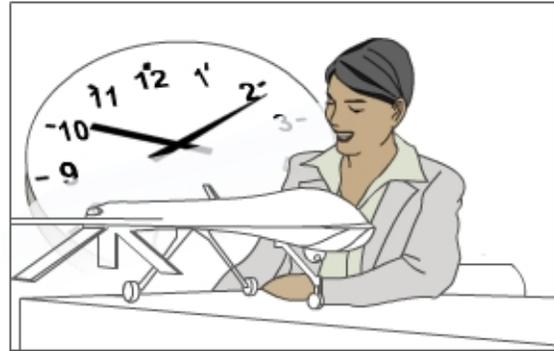
As a cost analyst, you need to know what an **efficiency rate** represents and how to apply it to:

- Assess contractor productivity.
- Develop estimates of labor hours on future projects.

Let's start with a component of the efficiency rate—the standard hour.

A **standard hour** is defined as the number of hours a **skilled** worker will use to complete a given job under **ideal** or **perfect conditions**.

Standard hours are published in government and industry sources relative to the goods and services of interest.



Efficiency Rates

Now that you understand what **direct labor** is, let's examine a useful tool you can use to assess and estimate contractors' direct labor hours—the **efficiency rate**.

Since no worker can achieve the ideal all the time, a factor is applied to the standard hour to account for lost time due to work preparation, cleanup, personal time, operator fatigue, etc. This factor is called the **efficiency rate**.

Efficiency rate will vary from one contractor to the next. A contractor's efficiency rate is calculated as:

$$\text{(Task Standard Hours / Task Actual Hours)} * 100 = \text{Efficiency Rate}$$

The efficiency rate may be used to estimate direct labor hours on future projects. Divide the standard hours by the contractor's efficiency rate to estimate the number of hours it is likely to take the contractor to complete the task.

$$\text{Task Standard Hours / Efficiency Rate} = \text{Direct Labor Estimate}$$

Challenge—Efficiency Rate Calculation

Question

The standard hours to change the spark plugs on a tank are **15.75 hours**. On a recent contract, Contractor B averaged 22 hours. What is Contractor B's efficiency rate?

Answer

Contractor B's efficiency rate is **72%**.

Calculated as:

$$\frac{15.75 \text{ standard hours}}{22 \text{ actual hours}} \times 100 = 72\%$$

Challenge—Efficiency Rate Application

Question

Based on past performance, Contractor B's efficiency rate is **72%**. Contractor B bid on a job that is estimated to require **1,500 standard hours**. Use Contractor B's efficiency rate to project the number of direct labor hours they are likely to use.

Answer

Contractor B may require **2,083 hours**.

Calculated as:

$$\frac{1,500 \text{ standard hours}}{72\%} = 2,083 \text{ hours}$$

Labor Standard

Manufacturing involves tasks that are performed repetitively over time. As a result, **labor standards** can be established for these repetitive tasks.

Labor standards facilitate detailed cost evaluation and control, which can result in significant savings to the government.

A labor standard is composed of three elements:

- Leveled time
- Personal, fatigue, and delay (PF&D) allowances
- Special allowances

Leveled Time

Leveled time is one component of a labor standard. Leveled time is the time that a worker of **average** skill, making an **average** effort, under **average** conditions takes to complete a required task. There are a variety of techniques used to determine leveled time. The four most common are listed below.

Time study—During time studies, industrial engineers observe and record the time that a selected worker requires to perform each of the subtasks in the work design. Several observations are required to average out random variations and assure that all elements of the work have been considered.

Predetermined leveled times—Predetermined leveled times are based on basic motion standard data which capture basic body motions, such as reach, move, turn, grasp, position, release, disengage, and apply pressure.

Standard time data—Using standard time data is much like using predetermined leveled times, except that groups of motions (drilling a hole or painting a square foot of surface area) are estimated as a single element instead of individual body motions.

Work sampling—Work sampling is commonly used to develop non-engineering standards. Estimates are based on the proportion of time spent by one or more persons on a given activity.

Allowances

In addition to leveled time, the labor standard needs to include allowances for predictable and unpredictable **work stoppages**. **Personal, fatigue, and delay (PF&D)** allowances are made because no one can work continuously on a task for an entire shift.

Personal allowance—Personal allowance is time for a worker to take care of personal needs.

Fatigue allowance—Fatigue allowance is time to recuperate from work conditions and health concerns.

Delay allowance—Delay allowance is time for unavoidable, predictable, and unpredictable delays.

Along with the PF&D allowances listed above, a **special allowance** is included when formulating a labor standard. The special allowance is for infrequent, unpredictable occurrences such as power failures, machine breakdowns, and minor repairs

Challenge—Direct Labor Terms

Bethany Wong, a new cost analyst, needs your help. She's not sure of the distinction between **direct labor**, a **standard hour**, and a **labor standard**. Please explain, in the box below, how these three concepts are related but distinct.

Answer

Direct labor hours are those hours which can be tied directly to a particular task, work order, program, or contract.

Both **standard hours** and **labor standards** are used to predict the number of direct labor hours it will take to complete a task.

Standard hours are the number of hours it would take a **skilled** worker under **ideal** conditions to perform the task, while **labor standards** are more realistic measures that take into account **average** worker ability and unavoidable work **interruptions**

Summary

Congratulations! You have completed the **Labor Estimation Rates** lesson. Please take a moment to review the key information in this lesson.

Wrap Rate

The **wrap rate**, also called **fully burdened labor rate**, is an integral component of cost analysis and estimation. The wrap rate is called "**fully burdened**" because it includes not only direct labor costs but overhead costs and other costs as well. During the source selection process, costs analysts assess the legitimacy of competing contractors' wrap rates.

Direct Labor Hours

When calculating a contractor's wrap rate, the starting point is typically the direct labor hours. Direct labor hours are those hours which are explicitly attributed to a particular task, work order, contract, or program. Direct labor includes the direct, hands-on efforts to engineer and manufacture the product or system.

Standard Hours

Government and industry sources publish standard hour metrics. A **standard hour** is how long it takes a **skilled** worker under **ideal** or **perfect** conditions to complete a specified task. When trying to estimate how many direct hours a particular contractor is likely to need to complete a specific job, knowledge of the standard hours is a good starting point. To make an accurate estimate, however, you also need that particular contractor's efficiency rate.

Efficiency Rate

The **efficiency rate** is a useful tool to assess contractors' productivity and estimate contractors' direct labor hours. It is based on a contractor's past performance.

Efficiency rate is calculated by dividing the task standard hours by the actual hours the contractor required to complete the task, and then multiplying the quotient by 100. This results in that particular contractor's efficiency rate. Higher efficiency rates (closer to 100%) indicate greater productivity.

The contractor's efficiency rate can also be used to estimate direct labor hours on future projects. If you know that a particular contractor's efficiency rate is **90%** and a job requires **300 standard hours**, then you can divide 300 by .90 to estimate that particular contractor is likely to require **333 hours** to complete the job.

Labor Standard

Labor standards are used to make realistic estimations of how long it should take to complete a job. A labor standard includes leveled time—the amount of time it takes an average worker under average conditions to complete a specified task. After leveled time is established, it needs to be adjusted to allow for personal time, fatigue, and unavoidable delays. The resulting metric is the labor standard.

Rates

Glossary

Term	Definition
Assembly	Assembly involves the effort to combine parts into subassemblies and assemblies.
Cost Objective	Cost objective is an accounting term for a task, work order, product, program, or contract. In government acquisition the cost objective is normally the program or contract.
Cost of Money	Cost of money is sometimes an allowable other cost, depending on the contractual agreement the contractor has with the government. The cost of money is the cost of capital committed to facilities as an element of contract cost. Department of Defense (DoD) pays additional money for the contractor to maintain the production facilities, operating lines, etc., for the duration of the contract.
Delay Allowance	Delay allowance is an adjustment applied when formulating a labor standard to allow time for unavoidable predictable and unpredictable delays.
Design Engineering	Design engineering involves delineating the characteristics and specifications of the end product.
Direct Labor Hours	Direct labor hours are hours that can be explicitly attributed to a particular task, work order, program, or contract.
Direct Labor Wage Rate	Direct labor wage rate is the composite hourly wage rate of those employees who can be charged directly to a specific program or contract.
Efficiency Rate	Efficiency rate indicates a contractor's productivity and can be used to estimate direct labor hours on future projects. Efficiency rate is calculated by dividing a task's standard hours by the actual hours the contractor required to complete the task, and then multiplying the quotient by 100. Higher efficiency rates (closer to 100%) indicate greater productivity.
Engineering Overhead	Engineering overhead includes the cost of directing and supporting the activities of the engineering department.

Term	Definition
Exponential Moving Average	Exponential moving average, when applied to time series data, is the average of the last X number of observations but with varying weights assigned to each observation. The most recent observation is assigned the greatest weight and each preceding observation is given an exponentially smaller weight. It is applied to smooth out short-term fluctuations in time series data and amplify long-term trends or cycles.
Fabricating	Fabrication involves the fashioning of parts from raw materials or purchased materials.
Fatigue Allowance	Fatigue allowance is an adjustment applied when formulating a labor standard to allow time for workers to recuperate from work conditions and health concerns.
Forward Pricing Rate Agreements (FPRAs)	Forward pricing rate agreements (FPRAs) are negotiated by the government with contractors to set the pay standard for a variety of skill sets within a specified geographical region.
Fully Burdened Labor Cost	Fully burdened labor cost includes direct labor, overhead, and other costs. It is calculated by multiplying the contractor's wrap rate by the direct labor hours.
Fully Burdened Labor Rate (FBLR)	Fully burdened labor rate, also called "wrap rate," includes the contractor's direct labor wage rate, overhead costs rate, and other costs rate. It is used when assessing contractors' proposals and making cost estimates.
General and Administrative Costs	General and administrative expenses typically include the expenses of a company's general and executive offices, staff services, and other miscellaneous activities related to the overall business.
Labor Standard	Labor standards are used to make realistic estimations of how long it should take to complete a job. A labor standard includes leveled time—the amount of time it takes an average worker under average conditions to complete a specified task. After leveled time is established, it needs to be adjusted to allow for personal time, fatigue, and unavoidable delays. The resulting metric is the labor standard.
Leveled Time	Leveled time is one component of a labor standard. Leveled time is the time that a worker of average skill, making an average effort, under average conditions takes to complete a required task.
Manufacturing Engineering	Manufacturing engineering involves planning the manufacturing process, developing process instructions and work methods, shop loading, organizing work stations, and matching shop capabilities to contractual requirements.
Manufacturing Overhead	Manufacturing overhead, also known as "manufacturing expense" or "factory burden," includes all production costs except direct materials, direct labor, and other costs.

Term	Definition
Material Overhead	Material overhead includes costs related to the acquisition, transportation, receiving, inspection, handling, and storage of materials.
Other Costs	Other costs are any other costs the firm incurs but has not accounted for as either direct or overhead costs.
Overhead Costs	Overhead costs, also called "burden," are indirect costs that benefit multiple programs or contracts, and therefore cannot feasibly be charged directly to just one.
Personal Allowance	Personal allowance is an adjustment applied when formulating a labor standard to allow time for workers to take care of personal needs.
Predetermined Leveled Time	Predetermined leveled times are based on basic motion standard data which capture basic body motions, such as reach, move, turn, grasp, position, release, disengage, and apply pressure.
Profit	Profit is sometimes an allowable other cost, depending on the contractual agreement the contractor has with the government. Some acquisition contracts allow the contractor to include an agreed-upon amount of profit in addition to their costs. This is usually in return for taking on a difficult, high risk project that requires a long-term commitment of time and capital.
Quality Assurance Engineering	Quality assurance engineering involves the formulation of standards and specifications for tests and inspections.
Quality Control	Quality control involves the act of testing or inspecting the product during the manufacturing process and prior to final acceptance.
Recovery Rates	The recovery rate is used by contractors to allocate overhead and other costs to each program or contract they benefit. Recovery rates are calculated by dividing the total indirect cost pool dollars by a relevant base.
Regression Analysis	Regression analysis is a statistical technique that illuminates how the value of a dependent variable, such as direct labor wage rates, changes in response to changes in one or more independent variables, such as time.
Reliability and Maintainability Engineering	Reliability and maintainability engineering involves designing and manufacturing products to meet longevity and repair requirements.
Service Centers	Service centers are included in many firms to provide company-wide services such as scientific computer operation, data processing, copying, technical typing, photographing, etc.

Term	Definition
Simple Moving Average	Simple moving average, when applied to time series data, is the average of the last X number of observations. It is applied to smooth out short-term fluctuations in time series data and amplify long-term trends or cycles.
Special Allowance	Special allowance is an adjustment applied when formulating a labor standard to allow time for infrequent, unpredictable occurrences, such as power failures, machine breakdowns, and minor repairs.
Standard Hour	Standard hour is defined as the number of hours a skilled worker will use to complete a given job under ideal or perfect conditions.
Standard Time Data	Standard time data is based on groups of motions (drilling a hole or painting a square foot of surface area) that are estimated as a single element.
Sustaining Engineering	Sustaining engineering involves as needed support as problems arise throughout the life of the contract.
Time Study	During time studies, industrial engineers observe and record the time that a selected worker requires to perform each of the subtasks in the work design. Several observations are required to average out random variations and assure that all elements of the work have been considered.
Weighted Moving Average	Weighted moving average, when applied to time series data, is the average of the last X number of observations but with varying weights assigned to each observation. Usually the most recent is given the greatest weight, and each preceding observation is given a progressively smaller weight. It is applied to smooth out short-term fluctuations in time series data and amplify long-term trends or cycles.
Work Sampling	Work sampling is commonly used to develop non-engineering standards. Estimates are based on the proportion of time spent by one or more persons on a given activity.
Wrap Rate	Wrap rate, also called "fully burdened labor rate," includes the contractor's direct labor wage rate, overhead costs rate, and other costs rate. It is used when assessing contractors' proposals and making cost estimates.