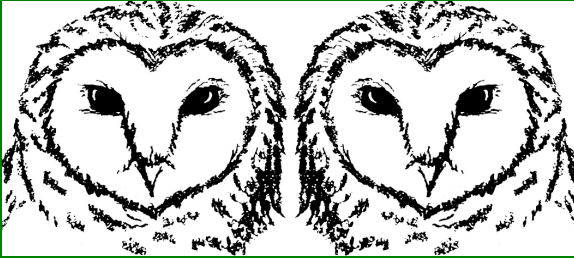


Position Paper

A QUICK OVERVIEW OF PROJECT ACCOUNTING



TechKnowPartners

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A QUICK OVERVIEW OF PROJECT ACCOUNTING

This article emphasizes the concept of project accounting in the construction industry. However, the concept applies in many other disciplines, such as job or project-based manufacturing, and systems development activities.

Financial, managerial, and regulatory accounting processes for projects...

There are three types of accounting processes – financial, managerial, and regulatory. Financial accounting processes are conducted according to generally accepted accounting principles, with reporting primarily for lenders and investors. Managerial accounting processes are used for internal control and decision making purposes. Regulatory accounting processes are required by certain Federal and State agencies.

The level of detail in the chart of accounts is a contributor to the effectiveness of the information delivered by the accounting processes. However, the greater the level of detail, the higher the cost to maintain the underlying data, systems, and processes.

For small closely held enterprises, the primary accounting method used is “on an income tax basis” because regulatory reporting requirements are the major consideration.

It is essential for every contractor to have an effective accounting process to track revenues and expenses by project. This process is for internal use in contrast to a project-wide system for all contractors to use. It is subsidiary to the accounting process that tracks income (revenues and capital gains) and expenses by period at the enterprise level in the general ledger. It is also linked to the receivables, inventory, and payables subsidiary processes for effective cash management. Furthermore, it is important to have effective payroll and related processes in place that track the data required by Federal and state laws and regulations, especially for “certified payrolls” on public works projects.

Historically, only larger contractors could gain access to automated accounting systems that report financial, managerial, and regulatory information. They often use in-house systems, either custom-built or package-based solutions. For smaller contractors, a spreadsheet may be sufficient for calculating costs on a project by project basis.

Outsourced accounting options are available through professional service firms and other service providers for contractors in all trades and of all sizes. Because there is an increasing trend towards web-based service providers that host applications on the internet, now even the smallest enterprises can take advantage of automated solutions.

Regardless of system used, even if it is paper and pencil, it is important to understand the concepts, and to know the early warning indicators of problems.

Because construction activities are subject to change, there may be many jobs associated with one project. The original bid is the first, but as scope changes occur, multiple jobs within the same project may evolve. It is important that change orders be properly estimated and accounted for. Over time, the hierarchy of jobs within projects for development, enhancements, and maintenance can become extremely complex.

It is important that revenues and expenses be tracked by each job within the project so that profits (and losses) can be understood, and controls can be exercised when exceptions arise. Therefore, the general and project accounting processes collectively should produce the normal cash flow, income, and balance sheet statements, and progress reports for each job within a project, and across all. An additional feature of the accounting processes is to be able to track all the projects for a given owner, so that total performance is understood by job within project for each owner, and across all.

In accordance with generally accepted accounting principles, the accrual-based accounting method requires that product costs are capitalized as inventory in the period when purchased, and expensed in the period when revenue is recognized. From an accounting perspective, expenses such as insurance, labor, operating supplies, rent, utilities, depreciation, and amortization are expired period costs.

Generally accepted accounting principles and the Internal Revenue Service permit two methods of job cost accounting for construction projects: *percentage of completion* and *completed contract*. The method used depends upon the length of the project, the risks, and the payment options.

In the percentage of completion method, revenues are recognized and costs expensed on a period by period basis. In the completed contract method, costs are capitalized until the project is substantially complete and revenue is recognized.

Further information may be obtained from Internal Revenue Service publication 3780, which also includes discussions of accounting methods and the allocation of indirect costs:

www.irs.gov/pub/irs-pdf/p3780.pdf

Project-wide management systems...

Owners, construction managers, and prime contractors may require all participants to use a centralized project-wide management system regardless of whatever each uses internally for their own purposes.

This system acts as a centralized repository for all contractors on a specific project, and tracks key documents such scope and objectives, contact information, organization charts, contracts, issue resolutions, work orders, change orders, daily records, inspector reports, incident reports, meeting agendas and minutes, key decisions, payment requests, progress reports, project schedules, schedule of values, work breakdown structures, critical path analyses, workers compensation claims, site photographs, and miscellaneous submittals.

Both estimated and actual time and cost data may be fed from each contractor's internal processes into the project-wide management system as necessary to track the work breakdown structure for budget analysis, and the critical path for schedule analysis for the entire project.

Owners, construction managers, and prime contractors have preferences for project management software that can include mainframe, client/server, or web-based solutions.

The effectiveness of these systems is determined by how well they enable collaboration between participants to reflect reality. Because the evidence of progress in construction work is tangible, it is easier to visually compare actual progress on site to that reflected in project management systems than in other endeavors, such as developing software. However, "estimates to complete" may be just guesses if not properly investigated.

The estimate to complete is an essential factor in a project management system because everything else depends on it, right from the start to the end. Because it is human nature to cover up errors and mistakes, there is a risk that the estimate to complete may be far from reality, leading to the “95 per cent complete for 95 percent of the project” syndrome.

Whereas project management systems that embrace work breakdown structures and critical path analysis techniques using hierarchies and networks are commonplace on complex construction projects, there is a new breed of web-based collaborative tools emerging. Such tools have “social networking” characteristics. The use of these tools in project management may help break down communication barriers between project participants. Thus problems may be identified and resolved earlier than otherwise would be the case, or even prevented, and it may be harder to disguise errors and mistakes.

Collaborative systems bring a “real-time” effect to project management, and enable participants in many places to communicate seamlessly. If project team members are communicating regularly, errors and mistakes can be minimized, and thus estimates to complete should become more reliable.

Understanding labor, materials and supplies, and project overhead costs...

Understanding labor, materials and supplies, and project overhead costs is a consequence of using managerial accounting processes for internal control and decision making purposes. Managerial accounting processes should be reconcilable to financial and regulatory accounting processes, otherwise erroneous results will emerge. However, policies may differ in the treatment of items between the three processes, such as production costs, fixed costs, and operating expenses.

Understanding such financial, managerial, and regulatory accounting processes is a complex subject. However, it is important that construction enterprise owners and managers have a basic understanding of cost drivers in order to make a profit.

Construction contractors must understand costing techniques as used by manufacturers for situations where components of subassemblies and finished products are manufactured in their workshops in continuous processes. However, in construction, continuous processes are not as common as in manufacturing unless a high volume of items is being produced for many small projects, very large ones, or both. Product costs are determined on the basis of the cost of production per period for the number of items produced.

Project accounting techniques used in construction have similar characteristics to job cost accounting as used by manufacturers for batched orders because there is a definite schedule of work to complete within a certain period of time. Using project accounting techniques, final deliverable costs include those of the individual components and the assembly work. Using job cost accounting techniques, product costs are determined by the volume of items in the batch. In both project and job costing, allowance must be made for set-up, doing the work, and cleaning up. The higher the quality of the set-up work, the lower the likelihood of rework.

...Costing methods...

Under generally accepted accounting principles, strict rules apply regarding how period, production process, product, and project costs are treated:

www.bldsolutions.com/articles/fmrrar.pdf

Generally accepted accounting principles take a narrower position on what can be classified as a production process or project cost than regulatory accounting requirements. For managerial accounting, it is a matter of policy.

Strict rules are necessary because financial statements prepared according to generally accepted accounting principles are used for external comparisons of enterprises in the same industry by lenders, investors, regulators, and industry analysts.

Managerial reports are for internal use only, and should never be presented to external parties without a disclaimer with respect to compliance or not with generally accepted accounting principles.

To add complexity to accounting processes, income tax returns must be prepared on a tax basis that requires the use of “uniform capitalization” (UNICAP) rules. These rules are set by the Internal Revenue Service and differ from generally accepted accounting principles.

In the construction industry, cost accounting techniques examine project deliverable costs within and between periods. In the manufacturing industry, these techniques examine job, production process, and product-related costs within and between periods. There are differing opinions about the effectiveness of such accounting techniques, such as cost allocation on a full absorption basis, variable direct costing, activity-based costing, and lean costing. The material contained herein gives a basic conceptual overview.

It is important to understand the concepts of price, cost, and profit, and how actual values may differ from estimates due to fluctuations in rates or units of quantity and volume.

Price is the exchange value that a customer (buyer) is willing to pay for purchasing an item and that a supplier (seller) is willing to receive for selling it. A cost is the exchange value bid or price paid by a buyer – the value that must be given up in order to acquire the item.

Sales revenue is the sum of the price multiplied by the volume for each type of item sold in a period. The difference between sales revenue and the cost of the labor, materials and supplies, production (manufacturing plant) or project overhead that make up the cost of products sold or the project deliverable is the gross profit. Under generally accepted accounting principles, operating expenses for selling, administrative, and general items are deducted from gross profit to derive pre-tax net.

Because of pressure on prices and sales revenues, it is essential that both manufacturers and contractors search for ways to reduce costs to maintain profits. Revenues always seem to decrease and costs increase over time, unless remedial action is taken.

Operating expenses represent the enterprise overhead. Managerial accounting policies and methods for allocating operating expenses may differ from those allowed under financial and regulatory accounting principles, especially for variable expenses – hence the need to reconcile them.

Many manufacturers base their gross profit targets on a ratio between gross profit and sales revenue known as the gross margin. A 50 percent gross margin (or higher) is a desired target for many manufactured products at launch. Sales revenue may be gross or net after discounts, returns, and allowances, depending on policy.

Note: by way of background, merchandisers that serve the construction industry calculate gross profit as the difference between sales revenue and cost of sales. Cost of sales includes cost of products sold and merchandising-related costs such as transportation, handling, and occupancy.

Gross margin drops over time due to competitive pressure. If operating expenses were, for example, 40 percent of sales revenue, then the net pre-tax profit margin would be 10 percent on a 50 percent gross. A 10 percent pre-tax net profit margin is optimistic for many enterprises.

In the construction industry, the deliverable from the job or project *is* the final finished product – an infrastructure item, which itself comprises many finished product components, either premanufactured or custom made for the project. The difference between the price and cost of the labor, materials and supplies, and the project overhead that make up the deliverable is the gross profit, which is usually estimated as a markup.

In the manufacturing industry, the more product items that are sold in an accounting period, the more gross profit to cover the operating expenses. In the construction industry, the accounting method used (percentage of completion or completed contract) impacts period profit.

In the construction industry, the more projects that realize profit in a period, the bigger the base for covering the enterprise overhead. Knowing the method (percentage of completion or completed contract) is essential to understanding profit. Losses should always be recognized when identified. Regardless of when profit is realized, cash needs must always be anticipated because of timing differences between when invoices are submitted and paid.

The markup for profit has to cover the enterprise overhead before a net profit can be realized. A “15 percent” markup is commonly quoted for net profit and overhead. However, it is important that gross and net profit margins be understood for each situation as opposed to applying an “across the board” rule of thumb, especially if the markup has to cover both project and enterprise overhead.

In smaller construction enterprises, there is essentially no difference between project and enterprise overhead because of limited resources; in larger ones, the enterprise overhead can be significant.

Note: some owners will specify the maximum markup for profit that a contractor can use on change orders to prevent the recovery of sunk costs incurred prior to the current need being identified.

...Standard and actual costing...

It is useful to employ *standard* managerial accounting methods for labor, materials and supplies, and overhead rates and costs to better understand behavior. Standard rates and costs are used for budgeting; actual costs and rates are for performance measurement.

Rate and unit of quantity and volume variances between budget and actual values should be analyzed and explained on a regular basis, and then corrective action should be taken accordingly.

Rates are based upon anticipated prices per unit, which may be fixed or fluctuate based upon supply and demand. Time and quantities are measures of inputs (materials and supplies), and volumes are measures of outputs (products and deliverables) on a per unit basis. Results for these measures vary according to productivity, efficiency, and effectiveness.

Standards are developed from historical trends and future projections, and are useful in environments where costs vary over time due to changes in market conditions, productivity, and efficiency.

Standard costs are either estimated or based on predetermined values. They are expressed as a rate per unit of labor time or quantity of materials and supplies, and the corresponding costs. Standard cost is the rate multiplied by the number of units of time or quantity.

However, before standards can be properly set, it is important to understand how actual costs are incurred.

Budgets are built from line items within cost classifications. For example, the cost for each trade or craft is a line item within the labor classification. The cost for each type is a line item within the materials and supplies classification.

Variations due to exception conditions, such as rate fluctuations, unusual work performance, or materials and supplies usage should be tracked and investigated.

Standard cost values should be reviewed against actual and reset as necessary to make budget estimates more realistic unless remedial action can be taken. Standards can also be set for operating expenses such as administrative activities.

When budgeting, costs are computed from rates and units to determine line item level amounts within labor, materials and supplies, and production or project overhead classifications. Average rates for classifications are derived by dividing the total costs by the total units. Actual rates are derived in the same manner for both line item and classification costs.

Costs are calculated from rates multiplied by standard or actual hours in a period when the rates are known (and are reliable), or rates are calculated by dividing standard or actual costs by the hours in a period when not known or deemed unreliable.

...Direct and indirect, fixed and variable, and controllable and uncontrollable costs...

Cost drivers are direct or indirect, fixed or variable, and controllable or uncontrollable. Anything that is not directly traceable to a product or a project deliverable is indirect overhead, either at the product, project, or enterprise level.

Indirect costs include materials and supplies, and other employment-related, asset-related, and service-related items. These costs are charged to the product or the project deliverable based upon allocation formulas or transfer prices/charges[†].

A worked example is used throughout this material to explain the concepts in detail using carpenter and painter trades. The example is based upon full absorption-based costing. However, certain managerial accounting policies are employed such that some operating expenses being charged to the project.

[†] Price to the sender/charge to the receiver

	Standard Hours Or Rate	Budgeted Cost At Standard Units	% of Total	Actual Rate	Actual Hours Or Units	Actual Cost of Total	% of Total	Variance Actual Less of Budget	% Actual of Budget	
Direct fully loaded labor	<i>\$66.69</i>	1,760.00	<i>\$117,372.80</i>	57.28%	<i>\$67.73</i>	1,775.00	<i>\$120,215.48</i>	57.77%	<i>(\$2,842.68)</i>	102.42%
Direct material and supplies			\$31,400.00	15.32%			\$31,623.37	15.20%	<i>(\$223.37)</i>	100.71%
Project overhead	<i>\$318.89</i>	176.00	<i>\$56,124.00</i>	27.39%	<i>\$319.61</i>	176.00	<i>\$56,251.50</i>	27.03%	<i>(\$127.50)</i>	100.23%
Total project			\$204,896.80	100.00%			\$208,090.35	100.00%	<i>(\$3,193.55)</i>	101.56%
Total direct fully burdened labor	<i>\$98.58</i>	1,760.00	<i>\$173,496.80</i>	84.68%	<i>\$99.42</i>	1,775.00	<i>\$176,466.98</i>	84.80%	<i>(\$2,970.18)</i>	101.71%

Note: in the example, rates in italics are derived, and negative variances (shown in parentheses) are unfavorable.

In the example, a contractor budgets a project cost at \$204,896.80 using standard rates, hours, and units as estimating guidelines. The budgeted total direct fully loaded labor cost is \$117,372.80 for 1,760 hours of work. The budgeted total direct materials and supplies costs are \$31,400.00. The budgeted total project overhead is \$56,124.00. There are 176 elapsed hours in the project (total of 22 days duration multiplied by 8 hours per day).

The actual project cost is \$208,090.35. The actual total direct fully loaded labor cost is \$120,215.48 for 1,775 hours of work. The actual total direct materials and supplies costs are \$31,623.37. The actual total project overhead is \$56,251.50. The project has a total overrun of 1.56% of actual to budgeted cost.

...Direct and indirect costs...

Direct costs are traceable to specific activities, and therefore controllable by whomever has responsibility for them. Indirect costs are incurred across a group of activities, and are not under the control of any specific individual responsible for them *within* the group. They represent overhead at a given level of activity. Production, project, and enterprise managers control overhead at their respective levels.

...Fixed and variable costs...

Fixed costs remain constant regardless of activity. Variable costs fluctuate in accordance with the resources used by activities. Variable costs increase or decrease in accordance with activity levels.

In slack periods, fixed costs can become a significant burden on overall project costs because they are always present. They can quickly consume budget if remedial action is not taken.

Fixed costs can be significant in the manufacturing industry because of the overhead associated with facilities such as plants and warehouses.

In the construction industry, ongoing fixed costs should be lower as a percentage of revenue than in the manufacturing because most work is performed at the job site – hence, most contractors don't need large workshop or warehouse facilities.

Variable costs are controlled by process or project managers. Fixed costs can be controlled by product or project managers if they are able to negotiate the price. Otherwise they are uncontrollable, either because the price is set by a higher level of management and charged to the project, or because the price was negotiated by a predecessor and is still applicable for contractual reasons.

However, proactive managers always look for opportunities to renegotiate undesirable prices.

Under full absorption-based costing, all production and project fixed costs are charged to products and project deliverables; under variable direct costing, only the variable costs are charged – fixed costs are treated as period expenses.

Absorption-based costing is also known as the full costing method and can be used in both financial and managerial accounting processes under generally accepted accounting principles. The method relies upon assumptions for cost allocation and transfer pricing/charging. Variable direct costing separates certain controllable costs from fixed costs that are present regardless of activity.

Under absorption-based costing, operating expenses are not included in product or project deliverable costs – production and project costs are limited to specific plant and site-related items that do not include selling, administrative, or general. From a managerial perspective, it is useful to know the impact of certain operating expenses, such as the cost of the procurement function on both production and project costs.

Under variable direct costing, variable operating expenses are included with variable production (manufacturing plant) or project in the analysis of product and project deliverable costs. As a consequence, the method cannot be used in the preparation of financial statements according to generally accepted accounting principles.

Under variable direct costing, profit is characterized by manufacturing and contribution margins. The manufacturing margin is the difference between sales revenue and variable manufacturing costs. The contribution margin is the difference between the manufacturing margin and variable operating expenses – the marginal profit per unit sale. Contribution margin is used in cost-volume-profit analyses to determine operating leverage – how growth in sales translates into growth in profits.

The variable cost method is essential to understanding how costs are incurred because it reports them on the basis of activity. It isolates fixed costs, which are useful to understand in their own right because they can be a heavy burden on an enterprise. Fixed costs exist whether there is production or project activity or not.

Under generally accepted accounting principles, procurement costs, i.e., the cost of purchasing materials and supplies, are charged as operating expenses, but under UNICAP they must be capitalized as product costs.

Under generally accepted accounting principles, only production costs are capitalized, and preproduction, presale, and sales costs are expensed.

Under UNICAP, all such costs are capitalized except sales.

www.irs.gov/businesses/small/industries/article/0,,id=97675,00.html

These rules do not apply to smaller enterprises with gross receipts of \$10 million or less in the three prior tax years, and property produced under long-term contracts.

In managerial accounting processes, certain operating expenses can be charged to products or project deliverables according to policy, but must be reconcilable to both financial and regulatory accounting processes.

Hence, those charges that are initially recorded as operating expenses can be charged to product or project deliverable costs using an allocation or transfer pricing/costing method.

Some costs are semi-variable, having both fixed and variable components. For example, a piece of equipment may be leased for the entire job at a fixed cost per month, but variable hourly use charges may apply also. Utilities charges have a fixed component for service delivery, and a variable component for usage.

One criticism of production and project cost accounting methods is that when overhead costs are allocated based upon formulas, managers may not have much, if any discretion as to the rules. Another criticism is that it is hard to isolate specific component costs within the allocation.

If allocated costs are a high percentage of total cost, then the project manager has little control. However, for most projects in the construction industry, variable direct labor cost is a major component, accounting for typically 35 to 70 percent of total project cost[†].

...Direct labor, direct materials and supplies, and overhead...

Construction project costs can be categorized as:

- Direct labor (controllable by project managers)
- Direct materials and supplies (controllable by project managers)
- Overhead – project costs for items not included in the deliverable – indirect materials and supplies, and other employment-related, asset-related, and service-related (partially controllable by project managers)

...Direct labor costs...

In the construction industry, direct labor costs are usually variable and are associated with those workers who are responsible for performing the trades and crafts involved on the project. These costs are incurred on the job site or in a workshop at the contractor's facility.

Labor costs vary according to productivity and efficiency. To minimize carrying costs, it is best that materials and supplies arrive on a “just-in-time” basis.

In contrast, labor costs in the manufacturing industry have become less variable in recent times because the increasing use of technology reduces the labor component of overall product cost.

† BLD experience

When permanent full-time workers are employed, labor costs are in effect fixed to the enterprise, and may vary only according to the production or project processes. Hence in the construction industry, variable costs are achieved by hiring workers for specific activities within projects, and then releasing them upon completion.

...Loaded labor costs and rates...

Partially loaded labor costs and rates are burdened by other components in addition to a basic hourly wage. These include direct cost items such as fringe benefits, employment and unemployment taxes (including training), and workers compensation insurance. Workers compensation insurance is expressed as a rate per hundred dollars of compensation, and therefore has to be converted to an hourly rate for labor cost calculations.

Fully loaded labor costs and rates are burdened by all known labor-related components. These include specific occupancy and equipment items used by workers such as desk space and tools, for which hourly rates have been derived. Small tools are expensed when purchased; heavy tools are capitalized and expensed according to depreciation schedules.

Partially or fully loaded labor costs and rates provide more accuracy in assessing performance than basic hourly wages.

Standard direct labor rates should be based upon estimated loaded labor rates where possible.

The granularity of labor costs and rates is a function of the detail maintained by the managerial accounting processes. Whereas basic wage and fringe benefit costs and rates are available by trade and craft, it may be more difficult to calculate other cost components to the same level of detail. Hence, labor costs and rates at the trade and craft levels may be skewed by allocations of total labor costs. Nevertheless, it is useful to know standard and actual labor costs and rates by trade and craft, and in aggregate for a project wherever possible.

Fringe benefit rates are added to basic wage rates per hour to form the straight hourly rate – straight time excludes overtime. Certain fringe benefits categories are often required under union agreements and on public works projects. However, employers may choose to add their own.

Fringe benefits are employment benefits given over and above the basic rate of pay, and may be paid into funds or in cash depending upon the labor agreement. Fringe benefits include, but are not limited to health and welfare, pensions, annuities, vacations and holidays. Some employers also include sick time.

Fringe benefits may or may not be taxable – the Internal Revenue Service publishes a guide on the appropriate tax treatment (publication 15b):

www.irs.gov/pub/irs-pdf/p15b.pdf

When overtime is incurred, a premium must be added for the cost of increased rates – either time-and-a-half, or double. The “overtime premium” is the cost of the overtime hours above the basic rate of pay. Workers compensation insurance is not paid on the overtime premium, but employment and unemployment taxes are paid up to the ceilings established by regulation. Overtime will skew actual costs relative to budget if it was not anticipated.

Construction enterprise owners and managers are often surprised at the magnitude of a fully loaded labor rate relative to the basic, especially when the overtime premium is included. Fully loaded rates can easily be double the basic rate – and even more if overtime is incurred.

	Standard Rate	Standard Hours Or Units	Budgeted Cost At Standard	% of Total	Actual Rate	Actual Hours Or Units	Actual Cost	% of Total	Variance Actual Less Budget	% Actual of Budget
Direct labor:										
Carpenter:										
Partially loaded straight time	\$64.24									
Other charged items	\$3.00									
Fully loaded rate	\$67.24	1,440.00	\$96,825.60	47.64%	\$68.20	1,457.00	\$99,367.40	48.14%	(\$2,541.80)	102.63%
Painter:										
Partially loaded straight time	\$61.71									
Other charged items	\$2.50									
Fully loaded rate	\$64.21	320.00	\$20,547.20	10.11%	\$65.56	318.00	\$20,848.08	10.10%	(\$300.88)	101.46%
Total direct labor	\$66.69	1,760.00	\$117,372.80	57.75%	\$67.73	1,775.00	\$120,215.48	58.24%	(\$2,842.68)	102.42%

In the example, the contractor budgets 1,440 hours of carpenter time and 320 hours of painter time.

The partially loaded straight time labor rate is \$64.24 for carpenters and \$61.71 for painters. This rate includes the basic hourly rate, plus fringe benefits, plus the employer share of employment and unemployment taxes, and workers compensation.

The other charged item rates are for occupancy and equipment used directly by workers – \$3.00 per hour for carpenters and \$2.50 for painters.

The standard fully loaded straight time labor rate is \$67.24 for carpenters and \$64.21 for painters.

The work will be performed over a 176 elapsed hour period. The budgeted labor cost is \$96,825.60 for carpenters, and \$20,547.20 for painters. The total budgeted labor cost is \$117,372.80.

The average standard fully loaded labor rate for the project is \$66.69 over 1,760 hours.

The actual labor cost is \$99,367.40 for carpenters for 1,457 hours of work, and \$20,848.08 for painters for 318 hours. The actual labor rates are \$68.20, and \$65.56 respectively. The actual total labor cost is \$120,215.48 at an average rate of \$67.73.

...Direct materials and supplies costs and rates...

Direct materials and supplies costs are those included in the finished project deliverable. They include raw materials such as cement, sub-assemblies such as frames without glass or sheetrock, and finished products in their own right such as millwork and appliances. Millwork includes cabinets, counters, and shelves.

Direct materials and supplies costs can be either fixed or variable. Costs of predetermined units, such as frames, doors, and windows are fixed when exact quantities are known. Costs of other raw materials and supplies are variable because of rework potential and waste minimization techniques. Materials and supplies costs include hauling or shipping, and taxes.

	Standard		Budgeted		% of Total	Actual Rate	Actual Hours	Actual Cost	% of Total	Variance	
	Standard Rate	Or Units	At Standard	Cost						Actual Less Budget	% Actual Budget
Direct material and supplies:											
Material A	\$15.00	900.00	\$13,500.00	6.64%	\$14.97	899.00	\$13,458.03	6.52%	\$41.97	99.69%	
Material B	\$17.45	1,000.00	\$17,450.00	8.59%	\$17.65	1,004.00	\$17,720.60	8.58%	(\$270.60)	101.55%	
Supplies C	\$5.00	25.00	\$125.00	0.06%	\$5.00	24.00	\$120.00	0.06%	\$5.00	96.00%	
Supplies D	\$25.00	13.00	\$325.00	0.16%	\$24.98	13.00	\$324.74	0.16%	\$0.26	99.92%	
Total direct materials and supplies			\$31,400.00	15.45%			\$31,623.37	15.32%	(\$223.37)	100.71%	

In the example, the contractor budgets \$31,400.00 for materials and supplies costs at standard rates and units. The actual costs are \$31,623.37.

...Overhead...

By definition, indirect costs are overhead at a given level. In the construction industry, indirect costs represent overhead incurred at the project level. In the manufacturing industry, indirect costs represent overhead incurred at the production (manufacturing plant) level. Overhead incurred at the enterprise level (operating expenses) is subtracted from gross profit to determine net.

...Overhead – indirect materials and supplies...

Indirect materials and supplies costs are those not associated with the project deliverable, but are essential to the project, such as cleaning and soldering supplies, fuel, and lubricants.

...Overhead – employment-related, asset-related, service-related...

Employment-related costs include indirect hourly labor and salaried personnel such as certain foreman, superintendents, inspectors, and project managers.

Indirect labor costs comprise personnel including facilities and equipment maintenance workers such as janitors, security guards, and engineers, and hourly wage foremen, and superintendents. These costs are variable.

Note: if foremen and superintendents actually perform work on the project deliverable, their costs are direct. On public works projects, such workers must then be paid prevailing wages.

Occupancy costs are either asset-related or service-related depending upon whether the facilities are owned or leased.

Asset-related items include manufacturing plant and project-related facilities and equipment that are owned by the enterprise. These costs include depreciation of acquisition costs and amortization of tenant improvements. Production and project facility and equipment insurance and property taxes should also be included.

Facilities and equipment items, such as trailers, leased office suites and furniture, and on-site equipment, may be dedicated or shared. Shared facilities and equipment may be used on other projects, or be part of the enterprise's permanent infrastructure.

When facilities and equipment are not shared, their costs are charged to the project if they are used solely for that purpose. If they are part of the enterprise's permanent infrastructure, they are treated as operating overhead. When facilities are shared, such as a common workshop, their costs are charged on a use basis. Facilities costs are usually fixed based upon square feet allocated or leased. Equipment costs are fixed or variable depending upon use – costs of equipment delivered to the job site for the project duration are fixed, but those for use on an hourly basis are variable.

Service-related costs include production and project-related bonding and insurance, leased facilities and equipment rents, utilities, and taxes other than those for employment-related and property.

According to managerial accounting policy, operating expenses for enterprise resources used for production or projects are charged as either employment or service-related costs based upon the appropriate allocation formula or transfer price/charge.

	Standard Rate	Standard Hours Or Units	Budgeted Cost At Standard	% of Total	Actual Rate	Actual Hours Or Units	Actual Cost	% of Total	Variance Actual Less Budget	% Actual of Budget
Project overhead:										
Indirect labor:										
Maintenance:										
Partially loaded straight time	\$45.00									
Other charged items	\$1.50									
Fully loaded rate	\$46.50	176.00	\$8,184.00	3.99%	\$46.25	175.00	\$8,093.75	3.89%	\$90.25	98.90%
Clerical:										
Transfer charge	\$45.00	88.00	\$3,960.00	1.93%	\$46.00	89.00	\$4,094.00	1.97%	(\$134.00)	103.38%
Total indirect labor	\$46.00	264.00	\$12,144.00	5.93%	\$46.17	264.00	\$12,187.75	5.86%	(\$43.75)	100.36%
Indirect materials and supplies:										
Material E	\$43.00	40.00	\$1,720.00	0.84%	\$43.21	41.00	\$1,771.61	0.85%	(\$51.61)	103.00%
Supplies F	\$52.00	5.00	\$260.00	0.13%	\$51.85	4.67	\$242.14	0.12%	\$17.86	93.13%
Total indirect materials and supplies			\$1,980.00	0.97%			\$2,013.75	0.97%	(\$33.75)	101.70%
Superintendent:										
Partially loaded salary			\$10,000.00				\$10,000.00		\$0.00	100.00%
Other charged items			\$3,500.00				\$3,250.00		\$250.00	92.86%
Total superintendent	\$76.70	176.00	\$13,500.00	6.59%	\$75.28	176.00	\$13,250.00	6.37%	\$250.00	98.15%
Project manager:										
Partially loaded salary			\$12,500.00				\$12,400.00	5.96%	\$100.00	99.20%
Other charged items			\$4,000.00				\$4,100.00	1.97%	(\$100.00)	102.50%
Total project manager	\$93.75	176.00	\$16,500.00	8.05%	\$93.75	176.00	\$16,500.00	7.93%	\$0.00	100.00%
Allocations and transfer charges:										
Facilities	\$28.41	176.00	\$5,000.00	2.44%		176.00	\$5,000.00	2.40%	\$0.00	100.00%
Equipment	\$14.20	176.00	\$2,500.00	1.22%		176.00	\$2,800.00	1.25%	(\$100.00)	104.00%
Utilities	\$14.20	176.00	\$2,500.00	1.22%		176.00	\$2,450.00	1.18%	\$50.00	98.00%
Administrative support	\$5.68	176.00	\$1,000.00	0.49%		176.00	\$1,000.00	0.48%	\$0.00	100.00%
Miscellaneous	\$5.68	176.00	\$1,000.00	0.49%		176.00	\$1,250.00	0.60%	(\$250.00)	125.00%
Total allocations and transfer charges	\$68.18	176.00	\$12,000.00	5.86%		176.00	\$12,300.00	5.91%	(\$300.00)	102.50%
Total project overhead	\$318.89	176.00	\$6,124.00	27.39%	\$319.61	176.00	\$6,251.50	27.03%	(\$127.50)	100.23%

In the example, the budgeted project overhead cost is \$56,124.00 for 176 standard elapsed hours in the period. The standard overhead rate on an elapsed time basis is \$318.89. Certain managerial accounting policies are applied to project overhead for such items as clerical and administrative support resulting in allocations and transfer charges.

The budgeted indirect materials and supplies cost is \$1,980.00.

The employment-related costs include hourly paid maintenance workers, a managerial accounting charge for clerical assistance, and a salaried superintendent and project manager.

The superintendent and project manager are dedicated to the project. Other charged items include occupancy and equipment used directly by the superintendent and project manager.

The standard fully loaded monthly cost is \$13,500 for the superintendent and \$16,500 for the project manager.

The asset-related costs include equipment, budgeted at \$2,500 per month. The service-related costs include facilities (all of which, such as trailers, are rented), utilities (based upon an allocation of general expenses), administrative support (based upon a managerial accounting charge for administrative expenses), and miscellaneous (based upon an allocation of other general expenses).

The actual project overhead cost is \$56,251.50 for 176 actual elapsed hours. The actual project overhead rate is \$319.61 per *elapsed* hour in the period.

...Overhead rate...

An hourly standard or actual overhead rate for a period can be established by dividing the project overhead costs in the period by the total standard or actual elapsed hours. This rate may vary from period to period because it is made up of both fixed and variable components. It should be recalculated periodically to ensure that costs are not being under or over recovered by the project.

Note: unless there is a high cost variance in the overhead caused by operating longer than the budgeted elapsed hours, the standard and actual elapsed hours should be the same. Elapsed hours increase when there is “off hours” work that consumes overhead.

As contractors build experience with projects, certain “rules of thumb” may become apparent for ratios of direct labor, direct materials and supplies, and project overhead costs. For example, some contractors experience “one-third, one-third, one-third.” Others may experience a higher ratio for labor relative to materials and supplies and overhead costs.

	Standard			Budgeted			Actual			Variance	
	Rate	Or Units	At Standard	% of Total	Actual Rate	Or Units	Actual Cost	% of Total	Less Budget	Actual Budget	
Total project			\$204,896.80	100.00%			\$208,090.35	100.00%	(\$3,193.55)	101.56%	
Total project less direct materials and supplies	\$985.78	176.00	\$173,496.80	84.68%	\$1,002.65	176.00	\$176,466.98	84.80%	(\$2,970.18)	101.71%	

In the example, the budgeted total project cost is \$204,896.80. With direct materials and supplies excluded, the cost is \$173,496.80. The standard rate per elapsed hour is \$985.78 across *all* direct workers. The actual total project cost is \$208,090.35. With actual direct materials and supplies excluded, the cost is \$176,466.98. The actual rate per elapsed hour is \$1,002.65 across *all* direct workers.

...Burdened labor costs and rates...

A project burdened labor cost is the loaded labor cost to which (indirect) project overhead has been added. A fully burdened labor cost represents all known costs except direct materials and supplies.

The fully burdened standard or actual labor rate is the fully burdened labor cost divided by the number of standard or actual hours in a period. It is a single rate for estimating budgeted performance or analyzing actual. This rate represents the cost of construction per hour. It is a major key indicator of construction performance.

Burdened labor costs are semi-variable because they are usually comprise both fixed and variable indirect costs. They should be recalculated periodically to ensure that costs are not being under or over recovered by the project.

	Standard Rate	Standard Hours Or Units	Budgeted Cost At Standard	% of Total	Actual Rate	Actual Hours Or Units	Actual Cost	% of Total	Variance Actual Less Budget	% Actual of Budget
Direct fully loaded labor:										
Carpenter	\$67.24	1,440.00	\$96,825.60	47.26%	\$68.20	1,457.00	\$99,367.40	47.75%	(\$2,541.80)	102.63%
Painter	\$64.21	320.00	\$20,547.20	10.03%	\$65.56	318.00	\$20,848.08	10.02%	(\$300.88)	101.46%
Total direct fully loaded labor	\$66.69	1,760.00	\$117,372.80	57.28%	\$67.73	1,775.00	\$120,215.48	57.77%	(\$2,842.68)	102.42%
Overhead per elapsed hour	\$318.89	176.00	\$56,124.00	27.39%	\$319.61	176.00	\$56,251.50	27.03%	(\$127.50)	100.23%
Overhead per labor hour	\$31.89	1,760.00	\$56,124.00	27.39%	\$31.69	1,775.00	\$56,251.50	27.03%	(\$127.50)	100.23%
Overhead per carpenter hour	\$31.89	1,440.00	\$45,919.64	22.41%	\$31.69	1,457.00	\$46,173.77	22.19%	(\$254.13)	100.55%
Overhead per painter hour	\$31.89	320.00	\$10,204.36	4.98%	\$31.69	318.00	\$10,077.73	4.84%	\$126.63	98.76%
Direct fully burdened labor:										
Carpenter	\$99.13	1,440.00	\$142,745.24	69.67%	\$99.89	1,457.00	\$145,541.17	69.94%	(\$2,795.93)	101.96%
Painter	\$96.10	320.00	\$30,751.56	15.01%	\$97.25	318.00	\$30,926.81	14.86%	(\$174.25)	100.57%
Total direct fully burdened labor	\$98.58	1,760.00	\$173,496.80	84.68%	\$99.42	1,775.00	\$176,466.98	84.80%	(\$2,970.18)	101.71%

In the example, the budgeted project overhead cost is \$56,124.00 for 1,760 estimated hours, and \$31.89 per estimated work hour (for both carpenters and painters). The standard fully burdened labor rate is \$99.13 (\$67.24 plus \$31.89) per hour for carpenters and \$96.10 (\$64.21 plus \$31.89) for painters. The standard fully burdened labor rate for the project is \$98.58 per work hour.

The actual overhead cost is \$56,251.50 for 1,775 hours, and \$31.69 per actual work hour (for both carpenters and painters). The actual fully burdened labor rate for the project is \$99.42 per work hour.

...Standard versus actual...

Once actual cost behavior for a construction enterprise is understood by owners and managers, it is possible to develop reasonable standards for budget estimates. Project budgets are prepared from standard rates multiplied by estimated hours derived from standard guidelines. Standard average fully burdened labor rates provide a quick method for estimating. However, standard burdened labor rates by trade and craft should be used when more accuracy is required, assuming that there is a reasonable basis for allocating overhead between them.

The highest precision in estimating is achieved by developing a project budget for every line item over all projected time periods, from which the standard costs and average rates can be derived. When time does not permit, predetermined standards provide a certain level of accuracy. However, for large and high risk projects, standards should be developed de novo accordingly.

Standard estimating guidelines may be modified by inflators or deflators depending upon specific project conditions and circumstances. Inflators are used when complexity is considered to be greater than standard; deflators are used when complexity is considered to be less. Based upon actual project performance, standard estimating guidelines must be updated over time. Once established, variances between budgeted and actual costs and rates can be calculated to determine if performance is better or worse than plan, or whether the estimates are inaccurate, or both.

It is always important to establish a feedback loop at the end of a project or major milestone, so that estimates can be reviewed and refined for the future.

	Standard Hours		Budgeted Cost		Actual Hours		%		Variance		%	
	Standard Rate	Or Units	At Standard	of Total	Actual Rate	Or Units	Actual Cost	of Total	Actual Less Budget	of Budget	Actual	of Budget
Direct fully loaded labor	\$66.69	1,760.00	\$117,372.80	57.28%	\$67.73	1,775.00	\$120,215.48	57.77%	(\$2,842.68)		102.42%	
Direct material and supplies			\$31,400.00	15.32%			\$31,623.37	15.20%	(\$223.37)		100.71%	
Project overhead	\$318.89	176.00	\$56,124.00	27.39%	\$319.61	176.00	\$56,251.50	27.03%	(\$127.50)		100.23%	
Total project			\$204,896.80	100.00%			\$208,090.35	100.00%	(\$3,193.55)		101.56%	
Total direct fully burdened labor	\$98.58	1,760.00	\$173,496.80	84.68%	\$99.42	1,775.00	\$176,466.98	84.80%	(\$2,970.18)		101.71%	

In the example, the budgeted total project cost is \$204,896.80; with budgeted direct materials and supplies excluded, the budgeted cost is \$173,496.80. The standard total fully burdened labor rate for the project is \$98.58. This is the standard rate *per* direct worker hour.

The actual total project cost is \$208,090.35; with actual direct materials and supplies excluded, the actual cost is \$176,466.98. The actual total fully burdened labor rate for the project is \$99.42. This is the actual rate *per* direct worker hour.

Note that fully burdened rates are almost 1.5 times the fully loaded.

...Firm and enterprise costs and rates...

The firm labor cost is the fully burdened labor cost further burdened by all operating expenses in a period for an enterprise in a *specific* market. The enterprise labor cost is the average firm labor cost across *all* markets. The period firm or enterprise labor rate is the firm or enterprise labor cost divided by the standard or actual hours in the period. This rate indicates the cost of the construction enterprise per hour, either in a specific market or in its entirety, excluding the direct materials and supplies.

Firm labor rates are useful to know when an enterprise operates in different markets with disparate labor costs (or other items). For example, for a specific trade or craft, there may be a major difference between the Northern California and Southern California markets, or even between Los Angeles and San Diego.

Firm and enterprise labor costs and rates are useful key indicators for managing profits, especially when labor costs are a high percentage of total, as is usually the case in the construction industry.

Project profit is a function of the ability of foreman, superintendents, and management to control costs at their level of responsibility.

In cases where wage rates are fixed, such as under union agreements or on public works projects, managing productivity, efficiency, and overhead costs are essential to profitability.

However, the use of project contingency is also essential, because according to Parkinson's Law, work expands according to the time available for its completion. Due to the uncertainty of construction, some work may be unexpected and not provided for in original budgets. Project contingency is a budget reserve for unplanned events or performance.

The firm rate is an indicator of performance including net profit in a specific market. The firm rate is the fully burdened labor cost to which net profit has been added in a market divided by the total actual or standard hours worked in the period. The enterprise rate is an indicator of performance for the entire enterprise, and is average firm rate across all markets.

The firm and enterprise rates represent amounts that are or must be recovered per hour to cover all non direct materials and supplies costs and earn a profit. They provide a basis for comparison between enterprises.

Firm and enterprise rates are used widely in other industries, such as in professional services as fees for architects, accountants, attorneys, consultants, and engineers.

Burdened rates, before or after enterprise overhead and profit markup, are a factor in determining the schedule of values as required by owners in most construction contracts.

Key success factor...

It is important that the follow-on activities from the project definition be monitored with milestones and progress reporting. It is easy to lose control of such activities if they are not properly monitored, especially if new opportunities and threats subsequently arise.



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