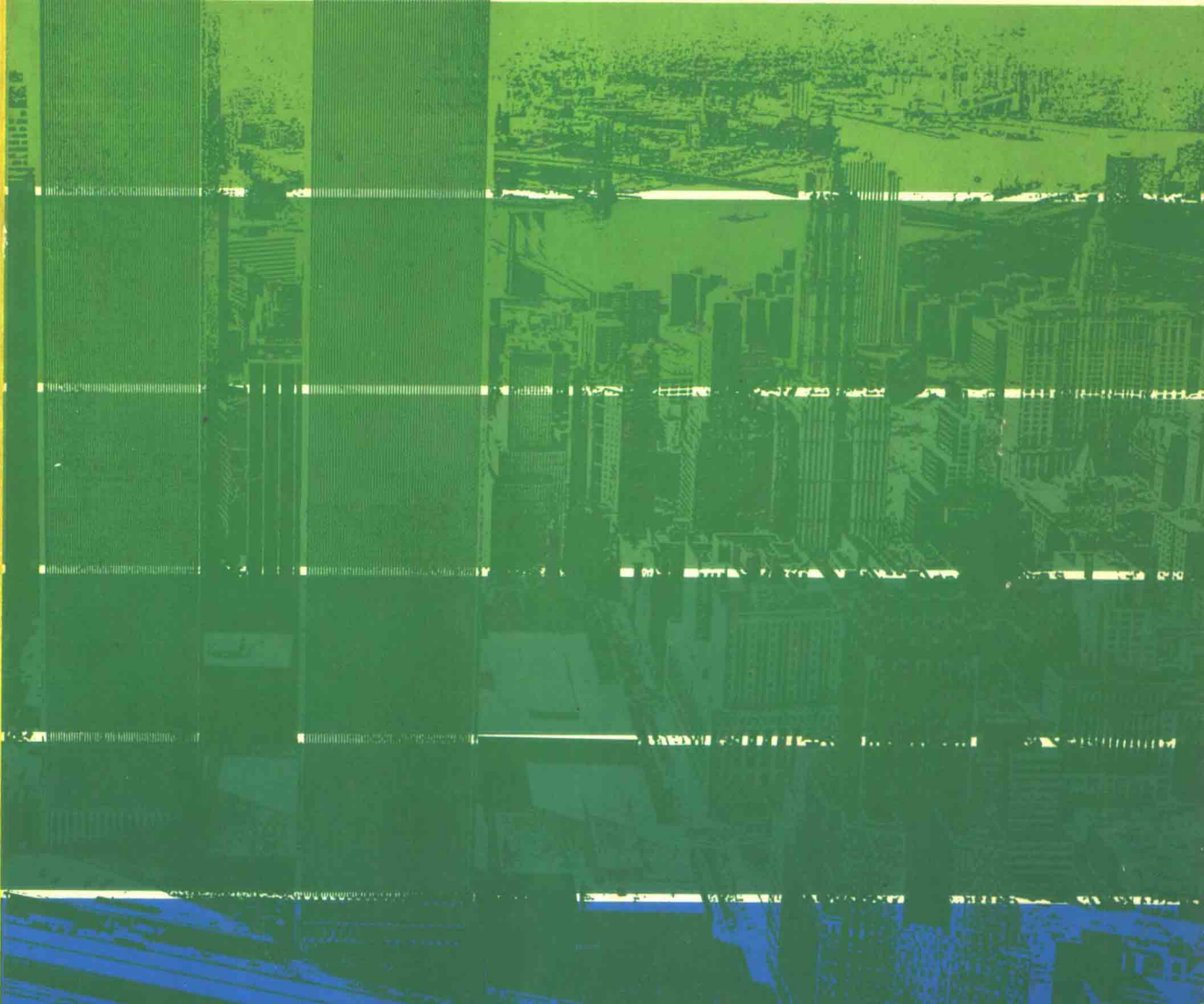


# PRINCIPLES OF COST ACCOUNTING

SCHMIEDICKE • NAGY  
SEVENTH EDITION



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# PREFACE

The concepts of accounting for costs permeate all organizations. However, the use and understanding of such concepts are vital to business organizations which are primarily concerned with the manufacture of products. The increasing importance of costing can be judged by the number of new textbooks arriving at colleges and universities from various publishers. The new titles are not typically "Cost Accounting," but rather "Costing" with some emphasis on managerial or management accounting.

Although cost accounting, managerial accounting, and management accounting share many common ideas and concepts, it is difficult to isolate any one facet as exclusive to any particular area. However, it does seem apparent that the solid foundation of study in any of these areas should rest on the cost systems, with the premise that a more complete understanding of the systems will result in a more in depth analysis of management problems. In this edition, the seventh, we present a thorough and contemporary view of all commonly used cost accounting systems, along with the special problem-solving techniques which are used with routine and nonroutine cost problems requiring solution by management.

The first chapter is an overview of subjects which are more thoroughly examined in subsequent chapters. The subject matter includes discussions of the elements of cost, job order costing, process costing, and standard costing. The first chapter outlines the schematic for the more complete and thorough discussions which follow. The overall view is presented to overcome any criticism that the subsequent study of the "pieces" cannot be fitted to the overall system.

The second, third, and fourth chapters are detailed discussions of the cost elements: materials, labor, and factory overhead. Practice and theory are blended throughout the discussions in all chapters; however, in these chapters the theoretical aspects of the elemental

studies may be more apparent because of the emphasis on internal control requirements.

The fifth chapter reviews the material covered in the previous four chapters by illustrating one month of manufacturing operations for a corporation. An optional practice set is available which continues the corporation's activities in the subsequent month.

The sixth and seventh chapters cover process costing. The sixth chapter introduces the general procedures involved with process costing that include departmental and nondepartmental factories, equivalent production with the average cost method, and the department-to-department flow of costs. The seventh chapter covers the more specialized techniques of process costing. They include equivalent production determinations when the cost elements are not uniformly added to a process, accounting for lost units and an increase in units, the first-in, first-out method, joint products, by-products, and whether to sell a product or process it further.

The eighth and ninth chapters cover standard costs. The eighth chapter stresses the general procedures of standard cost systems and the procedures that pertain to materials and labor. These procedures include determining materials and labor variances and their analyses. Yield and mix variance analyses have been added to the subjects covered in this edition. The ninth chapter emphasizes the standard variances for factory overhead. The two- and three-variance overhead analysis methods are presented. The chapter also discusses the budgeting of factory overhead and budgets in general.

Chapter 10 focuses on managerial uses of cost data. The chapter covers direct costing, segment reporting, cost-volume-profit analysis, distribution costing, special problems involving decisions to make or buy, operate or shut down, and differential costing.

Discussion questions, short exercises, and comprehensive problems are presented at the end of each chapter. The seventh addition includes a greater number of exercises and problems than the previous edition, and at least one exercise or problem is provided for each major topic covered in the text.

Although this revision has been updated and changed to meet the contemporary standard for a principles of cost accounting textbook, we have stood steadfastly by the goals established in the previous editions that clarity in the subject matter presentation and the text's teachability would not be sacrificed with the additions and changes.

The authors wish to thank the American Institute of Certified Public Accountants for permission to use their materials in this publication.

Robert E. Schmiedicke  
Charles F. Nagy

# CONTENTS

Chapter 1	Introduction to Cost Accounting	1
	The Manufacturing Process	2
	Uses of Cost Accounting Data	3
	Relationship of Cost Accounting to Financial Accounting	7
	Elements of Cost	9
	Flow of Costs	11
	Illustration of Accounting for Manufacturing Costs	12
	Cost Accounting Systems	20
	Standard Cost System	32
	Organizations Influencing Cost Accounting Principles and Procedures	32
Chapter 2	Accounting for Materials	43
	Controlling Materials	44
	Materials Control Procedures	50
	Accounting for Materials	60
	Scrap, Spoiled Goods, and Defective Work	74
	Summary	79
Chapter 3	Accounting for Labor	93
	Wage Plans	94
	Controlling Labor Cost	96
	Accounting for Labor Costs	104
Chapter 4	Accounting for Factory Overhead	135
	Identifying Cost Behavior Patterns	136
	Budgeting Factory Overhead Costs	142
	Accounting for Actual Factory Overhead	143
	Applying Factory Overhead	160
	Calculating Budget and Volume Variances	168
	Application of Principles	175

---

**Chapter 5 Job Order Cost Accounting — Application of Principles 191**

---

Comprehensive Illustration of Job Order Cost Accounting 191

---

**Chapter 6 Process Cost Accounting — General Procedures 235**

---

Comparison of Basic Cost Systems 235  
Product Cost in a Process Cost System 237  
Work in Process Inventories 238

---

**Chapter 7 Process Cost Accounting — Special Procedures 269**

---

Equivalent Production — Materials Not Uniformly Applied 269  
Units Lost in Production 278  
Units Gained in Production 284  
Equivalent Production — First-In, First-Out (Fifo) Method 285  
Joint Products and By-Products 294  
Sell or Process Further 299

---

**Chapter 8 Standard Cost Accounting — Materials and Labor 314**

---

Types of Standards 315  
Standard Cost Procedures 316

---

**Chapter 9 Standard Cost Accounting — Factory Overhead 349**

---

Two-Variance Method of Analysis 350  
Budgeted Factory Overhead 356  
Three-Variance Method of Analysis 370

---

**Chapter 10 Cost Analysis for Management Decision Making 384**

---

Direct Costing 385  
Segment Reporting for Profitability Analysis 390  
Cost-Volume-Profit Analysis 392  
Costs for Decision Making 399  
Differential Cost Analysis 402  
Distribution Costs 408

---

**Index 424**

---



# Introduction to Cost Accounting

Over the past several years, there has been a steady, significant increase in the costs of materials, labor, and other manufacturing needs, and it appears that this trend will continue. The inclination is to pass on the higher costs of manufactured products to the consumer by increasing selling prices. Quite often, however, a company is precluded from doing this by intense domestic and foreign competition. As a result, many companies today are faced with the dilemma of increasing costs and relatively restricted selling prices. In addition, changing consumer demands and new technologies require the development of new and attractive products as well as more effective methods of marketing and servicing these goods. In order to remain competitive today, manufacturers must have control of costs and be ready to exploit new opportunities. Otherwise, they can be forced into declining economic growth and a vicious downward spiral of reduced capital expansion, decreasing profits, a declining work force, loss of markets, and eventual oblivion.

The importance of sound financial information including specific cost data, has always been recognized, but in the current economic environment, such information is crucial to the survival of business and industry. The function of **cost accounting** is to provide the detailed cost data which are essential to management in controlling current operations and planning for the future. It provides the infor-



mation that management needs in order to allocate resources to the most efficient and profitable areas of operation.

All types of business entities — manufacturing, merchandising, and service businesses — require **information systems** which provide the necessary financial data. Because of the nature of the manufacturing process, the information systems of manufacturing entities must be designed to accumulate detailed cost data relating to the production process. Thus, it is common today for small, medium, and large manufacturing companies to have structured **cost accounting systems**. Stated simply, these systems show what costs were incurred and where and how these costs were utilized. While cost accounting principles and procedures discussed in this text are used primarily by the manufacturing industry, many of the basic principles of control are also used by merchandising and service businesses. Cost accounting today is recognized as being essential to efficient operations of business and industry.

## THE MANUFACTURING PROCESS

In order to appreciate the importance of an efficient cost system, it is necessary to understand the nature of the manufacturing process. In many ways, the activities of the manufacturing organization are similar to those of the merchandising business. Both are concerned with purchasing, storing, and selling of goods; both must have efficient management and adequate sources of capital; both may employ hundreds or thousands of workers. In the manufacturing process itself, we see the distinction between the two, for while merchandisers buy items in marketable form to be resold to their customers, manufacturers must make the goods they sell. Once the merchandising organization has acquired and stored goods, it is ready to carry out the marketing function. The purchase of materials by a manufacturer, however, is only the beginning of a long, and sometimes complex, chain of events that will eventually produce a finished article ready for sale.

The **manufacturing process** involves the conversion of raw materials into finished goods through the application of labor and the incurrence of various factory expenses. The manufacturer must make a major investment in physical facilities, such as factory buildings and warehouses, and acquire many specialized types of machinery and equipment. In order to carry out the *manufacturing process*, the manufacturer must purchase appropriate quantities of raw materials, supplies, and parts and build up a work force to convert these raw materials, supplies, and parts into finished goods.

In addition to the cost of materials and labor, the manufacturer incurs other expenses in the production process. Many of these costs, such as depreciation, taxes, insurance, and utilities, are similar to those incurred by a merchandising concern. Other costs, such as machine maintenance and repair, materials handling, and inspection, are peculiar to the manufacturing industry.

Once the goods have been manufactured and are ready for sale, the manufacturer performs basically the same functions as the merchandiser in storing and marketing the goods. The methods of accounting for sales, cost of goods sold, and selling and administrative expenses are similar to those of the merchandising organization.

## USES OF COST ACCOUNTING DATA

Principles of cost accounting have been developed which enable the manufacturer to process the many different costs associated with manufacturing and to provide built-in control features. The information produced by a cost accounting system provides a basis for determining product costs and aids management in planning and controlling operations.

### Determining Product Costs

Cost accounting procedures provide the means to gather the data needed to determine product costs and thus to generate meaningful financial statements and other reports, schedules, and analyses that are relevant to management. In preparing financial statements, knowledge of product costs is necessary for determining the cost of goods sold and for valuing inventories.

Cost procedures must be designed to permit the determination of **unit costs** as well as total product costs. The fact that a factory spent \$10,000 for labor in a certain month is not, in itself, significant information; but if this labor produced 5,000 finished units, the fact that the cost of labor was \$2 per unit is important because this figure can be compared to the unit labor cost of other periods and the trends analyzed.

Unit cost information is also useful in making a variety of important marketing decisions:

- (1) *Determining the selling price of a product.* A knowledge of the cost of manufacturing a unit of product aids in setting the selling price. This price should be high enough to absorb the cost of producing the item, pay a portion of marketing and administrative expenses, and provide a profit.

- (2) *Meeting competition.* If a product is being undersold by a competitor, detailed information regarding unit costs can be effectively used to determine whether the problem can be resolved by a reduction in selling price, a reduction of manufacturing costs, or the elimination of the item.
- (3) *Bidding.* Many manufacturing organizations must submit competitive bids in order to be awarded manufacturing contracts from government, business, and industry. An analysis of the costs relating to the manufacture of any particular item is of great importance in determining the bid price.
- (4) *Analyzing profitability.* Management can determine the amount of profit that each product earns and possibly eliminate those that are least profitable, thereby concentrating all efforts on those items that are most profitable. It is not uncommon, however, for some companies to retain a certain line of goods yielding a very low profit, or even a loss, in order to provide the variety of items that will attract customers who also purchase the more profitable items.

### Planning and Control

The ultimate value of cost accounting lies in the use of the data accumulated and reported. One of the most important functions of cost accounting is the development of information which can be used by management in planning and controlling operations.

**Planning** is the process of selecting goals and objectives for the firm and determining the means by which the firm will attain these objectives. Effective planning is facilitated by the following:

- (1) *Clearly defined objectives of the manufacturing operation.* These objectives may be expressed in terms of the number of units to be produced, the desired quality at the lowest cost, and the timing necessary to meet the needs of consumer demand while avoiding the financial strain of being overstocked.
- (2) *The development of a program that will assist and guide the company in reaching its objectives.* This detailed plan includes a description of necessary manufacturing operations to be performed, a projection of personnel needs for the period, and the coordination of the timely acquisition of materials and facilities.

Cost accounting aids in the development of plans by providing historical costs that serve as a basis for projecting data for planning. Management can analyze trends and relationships among such data as an aid in estimating future costs and operating results and in making decisions regarding the acquisition of additional facilities, changes in marketing strategies, and obtaining additional capital.

The word “control” is used in many different ways, but from the viewpoint of the manufacturing concern, **control** is the process of monitoring the company’s operations and determining whether the

objectives identified in the planning process are being accomplished. Effective control is achieved through:

- (1) Assigning responsibility
- (2) Periodically measuring results
- (3) Taking necessary corrective action
- (4) Searching for ways to reduce costs

**Assigning Responsibility.** Responsibility should be assigned for each detail of the master production plan. All managers and supervisors should know precisely what their responsibilities are in terms of efficiency, operations, production, and costs. The key to proper control involves the use of responsibility accounting and cost centers.

The essence of **responsibility accounting** is the assignment of accountability for costs or production results to those individuals who have the authority to influence costs or production. It involves an information system that traces these data to the managers who are responsible for them.

A **cost center** is a unit of activity within the factory to which costs may be practically and equitably assigned. A cost center may be a department or a group of workers; it could represent one job, one process, or one manufacturing operation. The criteria for a cost center are (1) a reasonable basis on which manufacturing costs can be allocated and (2) a person who has control over and is accountable for many of the costs charged to that center.

It is important to recognize that, with responsibility accounting, the manager of a department is accountable only for those costs that are controllable by that person. For instance, the costs of labor and materials will be charged to the cost center, but the department head may be responsible only for the quantity of materials used and the number of labor hours worked. This person would probably not be accountable for the unit cost of raw materials or the hourly rate paid the employees because these are normally beyond the control of the department head, being handled by the purchasing and personnel departments and affected by company policy. The manager may be responsible for the cost of machinery maintenance and repair due to misuse in the cost center, but would not be responsible for the costs of depreciation, taxes and insurance on the machinery. If production in a given period is lower than planned, this could be due to poor supervision which is the department head's responsibility, or, it may be that less-skilled workers are being hired — not a factor that can be controlled by the supervisor.

**Periodic reports** for a cost center may reflect all costs charged to that department and related production information. With the re-

sponsibility accounting system, the data for which the manager is specifically and individually responsible would be highlighted or segregated for the purpose of evaluating that manager's performance and initiating action to correct deficiencies. Quite often, however, both a departmental cost and production report and a separate performance report will be prepared for a cost center; the **performance report** will include only those costs and production data that are controllable by the center's manager.

It is imperative that these reports be furnished at regular intervals (monthly, weekly, or daily) on a timely basis. In order for them to provide the maximum benefit, they must be available as soon as possible after the end of the period being reported. Reports that are not produced in a timely fashion will lose their effectiveness as a control device.

**Periodically Measuring Results.** Actual operating results should be measured periodically and compared with the objectives established in the planning process. This analysis, which might be made monthly, weekly, or even on a daily basis, is a major part of cost control because it points out how current performance compares with the overall plan. The actual results in terms of dollars, units produced, hours worked, or materials used are compared with the master plan. This comparison is a primary feature of cost analysis. The number of dollars expended or the quantity of units produced have little significance until compared with the objective. Comparisons may also be made with actual results of prior periods, thus serving to point out meaningful trends.

**Taking Necessary Corrective Action.** The reports produced by the measurement and analysis of the results of operations may identify problem areas and deviations from the plan. Corrective action should be planned and implemented where necessary. A significant variation is a signal for attention. An investigation may reveal an area that needs adjustment or may show an area of strength where an especially efficient condition may be better utilized.

Management wants to know not only the results, but how the results — whether favorable or unfavorable — compare with a plan, why things happened, and who was responsible. Management must be prepared to improve or change existing conditions; otherwise, the periodic measurement of activity has little value.

**Searching for Ways to Reduce Costs.** Management has the responsibility not only to control costs, but also to reduce them in every

possible way consistent with the type of operation and quality of product. There must be a continuing search for less expensive materials, for more efficient methods of operating, and for improved usage of materials and labor.

## RELATIONSHIP OF COST ACCOUNTING TO FINANCIAL ACCOUNTING

The objective of accounting in general is the accumulation of financial information that is useful in making economic decisions. **Financial accounting** focuses upon the gathering of information to be used in the preparation of financial statements which meet the needs of investors, creditors, and regulatory and taxing authorities. Although these financial statements are useful to management, additional reports, schedules, and analyses are required for internal use in planning and control. **Cost accounting** provides the additional information required by management, and also provides data necessary for the preparation of financial statements. Cost accounting procedures are necessary for the determination of cost of goods sold on the income statement and the valuation of inventories on the balance sheet.

### Cost of Goods Sold

For the merchandising concern, the cost of goods sold is computed as follows:

Beginning merchandise inventory
Add purchases (merchandise)
<hr/>
Merchandise available for sale
Less ending merchandise inventory
<hr/>
Cost of goods sold
<hr/>

The amount of purchases represents the cost of the goods which were acquired during the period for resale.

Since the manufacturing concern *makes* rather than *buys* the products it has available for sale, the term “cost of goods manufactured” replaces “purchases” in determining the cost of goods sold:

Beginning finished goods inventory
Add cost of goods manufactured
<hr/>
Finished goods available for sale
Less ending finished goods inventory
<hr/>
Cost of goods sold
<hr/>

The amount for the cost of goods manufactured is supported by a manufacturing schedule detailing the costs of materials, labor, and the expenses of maintaining and operating a factory.

The format of the income statement for a manufacturer is not significantly different from that for a merchandiser. However, the cost accounting procedures involved in gathering the data for the determination of the cost of goods manufactured are considerably more complex than the recording of merchandise purchases, and these procedures are discussed in detail in subsequent chapters.

### Inventories

If the merchandiser has on hand unsold items of merchandise purchased for resale, the cost of these items is reflected in the current asset section of the balance sheet in the following manner:

Current assets:

Cash

Accounts receivable

Merchandise inventory

On the balance sheet of the manufacturing concern, the current asset section is expanded as follows:

Current assets:

Cash

Accounts receivable

Inventories:

Finished goods

Work in process

Materials

The balance in the **finished goods** account represents the total cost incurred in manufacturing goods that are complete but still on hand at the end of the period. The balance of the **work in process** account includes all of the manufacturing costs incurred to date for goods that are not yet completed. The balance of the **materials** account represents the cost of all materials purchased and on hand to be used in the manufacturing process, including raw materials, prefabricated parts, and other factory materials and supplies. Raw materials for one company are often the finished product of another company. For example, plastic to be used in the formation of office machine cases would be the finished product of a plastics manufacturer. Prefabricated parts would include units, such as electric motors, assembled by another manufacturer to be used in the manufacture of a product such as office machines. Other materials and supplies might include screws, nails, rivets, lubricants, and solvents.

**Valuation of Inventories.** The inventory accounts peculiar to manufacturing concerns simply represent costs gathered both by cost accounting procedures and by conventional inventory accounting procedures. Valuation of raw materials and supplies on hand is made through use of the inventory costing techniques that might be used by any business — first-in, first-out (fifo), last-in, first-out (lifo), or moving average. The company might maintain a **perpetual inventory** system, which involves keeping a continuous record of purchases, issues, and new balances of all goods in stock. Generally, these data are verified by periodic counts of selected items throughout the year. Under the perpetual system, inventory valuation data for financial statement purposes are available at any time, as distinguished from other methods that might require estimating inventory during the year for interim statements and shutting down operations to count all inventory items at the end of the year.

In addition to providing inventory valuation data for the financial statements, the detailed cost data and inventory records provide the information necessary for the control of inventory levels, the timely availability of materials for the factory, and the detection of pilferage, waste, and spoilage. Inventory valuation and control are discussed in detail in Chapter 2.

**Inventory Ledgers.** Both the merchandiser and the manufacturer may have the usual subsidiary ledgers, such as that for accounts receivable. In addition, the manufacturer generally maintains subsidiary ledgers for the general ledger inventory control accounts, Finished Goods, Work in Process, and Materials. The purpose of these subsidiary ledgers is to maintain a perpetual inventory and to furnish the detailed balances and information to support and prove the accuracy of the control accounts.

Some manufacturers, especially those that are decentralized, use a **factory ledger** which contains all of the accounts relating to manufacturing, including the inventory accounts. This self-balancing ledger, which is maintained at the factory, is tied in to the general ledger at the main office through the use of reciprocal control accounts.

## ELEMENTS OF COST

**Manufacturing or production costs** are classified into three basic elements: (1) **direct materials**, (2) **direct labor**, and (3) **factory overhead**.



## Direct Materials

The costs of materials which become part of the item being manufactured or which can be specifically identified with a certain product are classified as **direct materials**. Examples are: lumber used in making furniture, fabric used in the production of clothing, iron ore used in the manufacture of steel products, and rubber used in the production of tires.

There are many types of materials and supplies which are necessary for the manufacturing process but which cannot be specifically identified with any particular item manufactured or whose relative cost is too insignificant to measure. The costs of items such as sandpaper used in sanding furniture, lubricants used on machinery and other items for general factory use are classified as **indirect materials** and are included in factory overhead. Similarly classified are materials that actually become part of the finished product but whose costs are relatively insignificant, such as thread, screws, rivets, nails, and glue.

## Direct Labor

The cost of labor for those employees who perform some work on the item manufactured, such as machine operators or assembly line workers, is considered **direct labor**. The wages of those employees who are required for the manufacturing process but who do not work directly on the units being manufactured are considered **indirect labor** and are included in factory overhead. Under this classification would be the wages of department heads, inspectors, materials handlers and maintenance personnel.

Payroll related costs, such as payroll taxes, group insurance, sick pay, vacation and holiday pay, retirement program contributions, and other fringe benefits can be considered as part of direct labor costs, but are usually included in factory overhead.

## Factory Overhead

**Factory overhead** is known by various names — *factory burden*, *manufacturing expenses*, *indirect costs*, *overhead*, and *factory expenses* — and includes all costs related to the manufacturing of a product except direct materials and direct labor. This includes indirect materials and indirect labor as well as other manufacturing expenses, such as depreciation on the factory building and on machinery and equipment, supplies, heat, light, power, maintenance, insurance, and taxes.

The costs of direct materials and direct labor are sometimes combined and described as the **prime cost** of manufacturing a product.