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Essentials of COST ACCOUNTING

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Essentials of

COST ACCOUNTING

BY

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University of Kansas

FIRST EDITION

FOURTH IMPRESSION

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ESSENTIALS OF COST ACCOUNTING

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PREFACE

This text has been prepared in recognition of the apparent need for a comparatively short book presenting the "essentials" or "fundamentals" of cost control and accounting to students who will study cost accounting for one term, comprising a three-hour, two-hour, or one-quarter course.

The book is planned to serve students who have a broad interest in the field of cost accounting and who are interested in understanding the relationships between financial and cost accounting. The subject is introduced in an elementary form so that students who have had only one course in financial accounting will encounter no difficulties in making the transition from their first course in accounting to cost accounting. The importance of budgetary control is especially emphasized and the interrelation between budgeting and cost accounting is explained and illustrated. The book, written during defense preparations and actual war conditions, particularly stresses cost control and accounting for industrial enterprises, but does not neglect the important problems of control and accounting for distribution and administrative costs.

The text is not a revision of "Cost Accounting," which was written by the author in 1940, but is an abridged edition containing a condensation, reorganization, and simplification of much of the material appearing in the earlier 705-page book. A number of chapters dealing with specialized cost techniques have been omitted, other chapters have been condensed, and new material has been added.

The first eight chapters explain the fundamentals of cost control and accounting applicable to all types of concerns and to each of the three divisions of the business enterprise.

Chapters IX–XVII deal with the important principles of production and manufacturing costs. Job order costs are explained in four chapters; process costs are discussed in two chapters; joint cost and by-product accounting are introduced in a short chapter; and the section is concluded with two chapters dealing with standard costs in manufacturing enterprises.

Chapters XVIII–XX explain methods of controlling and accounting for distribution and administrative costs. Chapter XVIII describes accounting for actual distribution costs; Chap. XIX explains the use of standards in controlling distribution costs; and Chap. XX deals with actual and standard cost methods employed in controlling administrative costs.

The book may be used equally well in a three-hour, two-hour, or one-quarter course. Instructors teaching a two-hour or a one-quarter course will be able to cover the 20 chapters and assign several problems for each chapter; or, in lieu of some of the problems, they may elect to use either the Production Order (Job Order) Cost Practice Set or the Process Cost Practice Set. Instructors teaching a three-hour course will have adequate material for their students with the 20 chapters of text, the questions and problems accompanying each chapter, and one or both of the practice sets. Numerous cost charts, diagrams, forms and schedules to illustrate cost methods and procedures are included.

The author gratefully acknowledges the constructive suggestions of L. L. Vance of the University of California and K. Louhi of the University of Kansas and the cooperation of colleagues on the School of Business staff.

JOHN G. BLOCKER.

LAWRENCE, KANSAS,
June, 1942.

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PART I

FUNDAMENTALS OF COST CONTROL

CHAPTER I

THE NEED AND VALUE OF COST ACCOUNTING

Definition and Scope of Cost Accounting.—Cost accounting is the application of general accounting principles to the recording, analysis, and interpretation of material, of labor, and of overhead costs for functions, divisions, departments, operations, units of product, lines, sales territories, and salesmen. Detailed costs are summarized to show the cost of producing and selling an article in manufacturing concerns and to show the cost of a service or function in other types of business enterprise. Cost accounting is applicable to all types of business enterprise, including manufacturing, construction, mining, merchandising, railroads, gas, water and light utilities, and financial institutions; it is used advantageously in nonprofit organizations such as municipalities, universities, clubs, and hospitals. Within each business enterprise, costing may be carried on in the important divisions of production, transportation, selling, financing, and administration.

Financial Accounting the Forerunner of Cost Accounting.—Accounting may be divided into two general types:

a. Financial or general accounting.
b. Cost accounting.

For centuries, in fact, from as early a date as 443 B.C. in Roman history, financial accounting was deemed to be adequate for managerial control in private, public, and corporate business. Financial accounting was the outgrowth of single-entry bookkeeping. It was constructed and reconstructed, through the centuries of changing business methods, to present at regular intervals, usually yearly, information regarding the financial status of a business enterprise and to show in detail the nature of the changes that had taken place during the period. Through a long evolutionary process, financial accounting has reached a highly developed stage, with elaborate machine methods of recording and classifying business transactions. The accounting period has been reduced from a year to a month or to 3 months. From day to day during each period business transactions are analyzed and recorded in books or records of original entry. At frequent intervals during the period, or at the end of the period, transactions which have been properly classified and summarized are posted to a general ledger and to subsidiary ledgers or records.

At the end of the accounting period, expense and income accounts are closed into a summary account termed Profit and Loss. The Profit and Loss account is closed into Surplus or Proprietorship accounts and a profit and loss statement is prepared to present in summary form the changes in net worth that have taken place during the period; the items affecting the change are classified as expenses and revenue. The profit or loss for the period is considered to be the most significant figure in the accounting reports. A balance sheet is prepared at the end of each accounting period to exhibit assets, liabilities, and ownership or net worth; the statement is a cross section of the financial status of the enterprise at the particular moment.

Limitations of Financial Accounting.—In spite of new accounting devices, improved techniques, and elaborate subsidiary records, financial accounting is so limited and inadequate in regard to the information which can be supplied to management that, during the last 25 or 30 years, businessmen have been eager to adopt supplementary accounting methods known as cost accounting.

Financial accounting provides information concerning the business enterprise which permits management to control in a general way the major functions of a business: finance, administration, production, and distribution. However, details regarding the operating efficiency of these divisions are lacking. The following deficiencies in financial accounting have led to the development of cost accounting.

a. The classification of accounts does not give data regarding costs by departments, processes, products, and units in the manufacturing division; by units of product, lines, and sales territories in the selling or distribution division; and by departments, services, and functions in the administrative division.

b. Frequently materials and supplies are not properly controlled, and misappropriation, deterioration, obsolescence, and losses from scrap and defective parts result.

c. Wages and labor are not recorded by jobs, processes, departments, or services and are not interpreted in the light of cost factors. No company-wide system of incentives may be used to compensate laborers, clerks, salesmen, and executives for above-standard performance.

d. Expenses are not classified as to direct and indirect items and are not assigned to the product at each stage of production to show the controllable and uncontrollable items in overhead costs.

e. There is no well-developed system of standards to appraise the efficiency of the organization in the use of materials, incurrence of labor, and overhead costs by comparing the work of laborers, clerks, salesmen, and executives with what should have been accomplished in producing and selling a given number of products in an allotted period of time.

f. The accounting is historical, since the data are summarized at the end of the accounting period. There is no day-to-day cost information obtainable, and there may be no budgetary elements permitting the computation of predetermined costs.

g. Costs are not available as an aid in determining prices of products, services, production orders, or lines of products.

h. There is no complete analysis of losses due to idle plant and equipment showing cost variations between active and inactive periods and seasonal conditions in the industry.

i. In contemplated plans for expansion or contraction of plant and equipment, it is impossible to appraise and compare properly the profitableness of alternative methods, high cost of maintenance, and differences in efficiency between types of equipment.

j. Adequate information is not available for reports to outside agencies, such as banks, credit associations, Federal, state, and local governments, insurance companies, and trade associations. It is impossible to prepare detailed reports exhibiting complete cost data regarding operation of the enterprise for purposes of comparing such data with other periods of operation and with other concerns in the industry.

The deficiencies in financial accounting which have just been outlined may be restated as advantages or contributions of cost accounting. The elaboration of the services performed by the cost accountant will be undertaken throughout the book, but it may be of value to summarize briefly in a general way the contributions which can be made by the cost accountant under each of the subjects discussed as deficiencies in financial accounting.

Classification and Subdivision of Costs.—One of the most important contributions of cost accounting is that of detailed cost information for managerial control. In addition to a single profit or loss figure, as is supplied by financial accounting, the cost accountant classifies expenses and income by every possible subdivision of the business.

In a department store—with a system of financial accounting—revenue, expenses, and cost of goods sold are closed into a Profit and Loss account at the end of the accounting period. With the addition of a system of cost accounting, expenses are distributed by service departments, such as purchasing, personnel, and accounting, and by sales departments, typified by women's clothing and jewelry. Although cost of goods sold and sales elements are classified by sales departments and by classes of products, the ultimate goal is the net profit or loss for each sales department and for each line of product.

In financial institutions, exemplified by banks, the units of division for cost accounting are service and income departments, accounts of customers, and various services such as cashing checks and issuing drafts.

In governmental units, costing is done by departments or by projects; in some cases by mile of paving or by unit such as mattress, coat, can of meat, relief case, or dollar of lending; in schools, per pupil; and in hospitals, per patient-day.

There are numerous possibilities for cost control in the manufacturing division, depending upon the type of system. If the process or operation type of system is adopted, costs are accumulated by processes and by operations and are then transformed into unit costs, such as per ton,

gallon, thousand feet or machine. If a job order system is in use, costs are analyzed by departments or production centers and by production orders sent through production departments.

Cost accounting for sales distribution requires that costs be accumulated by sales service departments and sales branches or territories, by lines or types of products, and in some cases by salesmen and customers' accounts.

In administrative and financial divisions, cost accounting provides detailed costs required to maintain each division, department, and special service. Costs of financing by particular methods and analyses of travel by rail as compared with automobile are examples of accounting for special service.

Control of Materials and Supplies.—Since in all types of cost accounting, materials and supplies must be accounted for in terms of departments, processes, and units of production or service, a system of receiving, handling, and issuing materials and supplies is an essential part of cost control. Business papers, such as requisitions for purchase, purchase orders, material received reports, testing reports, invoices and vouchers, are used to support the receipt of the material and the payment of the obligations incurred. The perpetual inventory method is used to control properly the material in stockrooms. Subsidiary stock ledgers are set up with an account or card for each type of material, showing the date of the order, units and value of the goods received, quantity and value issued from stockrooms, and balance on hand. Materials are issued from stock only on requisition, and returns to stock are recorded on material returned reports. Materials issued may be classified by departments, production orders, territories, or services. Yearly, or more frequently, physical inventories of material are taken, and adjustments are made where variances between actual and book figures occur.

In planning a system of cost accounting in any type of concern, the starting point is usually the establishment of a system of control over materials. As materials proceed through production departments, inefficiencies in their use resulting from excessive quantities, defective work, and scrap are revealed by production reports. Control of raw materials and of parts follows production until goods are completed, and a form of perpetual inventory control is then exercised over finished goods.

Control of Wages and Salaries.—Cost accounting activities encourage accounting for labor by jobs and by operations. In many manufacturing concerns daily summary reports are prepared to show the number of hours and minutes worked and the wage rate for each worker per job or operation. Elaborate systems of incentives, such as piece-rates or bonus plans, are in use as a part of manufacturing cost accounting for that labor which can be identified with particular jobs or operations.

Salaried employees and laborers whose payroll time is in part or wholly of an indirect nature are accounted for on daily time reports which are summarized to provide weekly or semimonthly payrolls, classified by departments or services.

Although cost accounting is a benefit to the employer by establishing standards to measure efficiency of labor, to assist in the assignment of work to employees best fitted for it, and to determine the unit profit arising from each activity, it can be of equal or greater value to employees. Personnel of the concern can be benefited by the establishment of incentives. Piece-rates are used in the majority of manufacturing concerns and are being extended to include clerical work and accounting activities. Bonus plans and other forms of reward are being used to compensate supervisors, job foremen, clerks, department heads, and major executives for above-standard operations. Personnel directors are depending more and more on data supplied by cost accountants. Shop superintendents and foremen are able to rate their employees and to plan their work intelligently, with the result that the workers benefit by a consistent labor policy.

Expenses—Controllable and Fixed.—Expenses are all very much alike to the general or financial accountant. He compares expenses of one period with those of another, but he seldom classifies them as to controllable and uncontrollable items. The cost accountant first separates expenses into direct and indirect items. Direct expenses consist of material and labor which can be definitely identified with production, while indirect expenses, generally termed "overhead," are expenses such as depreciation, clerical salaries, supplies, and taxes, none of which can be definitely assigned to a single product or production order. This division of expenses permits the costing of production units from day to day.

The further classification of overhead or indirect expenses into controllable and uncontrollable, or fixed and variable, items permits the cost accountant to concentrate his attention on those expenses which can be reduced or eliminated. There is little the cost accountant can do to reduce taxes and insurance, but such variable expenses as clerical labor, idle time, supplies, power, and spoilage or waste in materials warrant his careful scrutiny.

Standards for Measuring Efficiency.—The most important new development in cost accounting is the use of standards to assist management in the allocation of responsibility and authority, to aid in making estimates and plans for the future, and to develop bases of measurement with which to evaluate the efficiency of operations. Executive judgment is naturally difficult in the absence of standards of performance against which actual results may be measured. The setting of standards of performance requires preliminary investigation and research involving

work of cost accountants, engineers, sales managers, and of various department heads. Past performance is examined, and time and motion studies are made to determine the best attainable standards of material, labor, and overhead as to both quantity and price, with no allowances for inefficiencies. As production progresses, actual performance is compared with predetermined standards to determine operating efficiency. Standards such as sales quotas, advertising appropriations, and travel allowances are set in advance of the accounting period in the sales or distribution division of business enterprises.

Budgeting.—Originally, cost accountants followed the plan of financial accounting in presenting historical costs, *i.e.*, they accumulated costs at the end of the accounting periods, monthly, quarterly, or yearly. Such costs, at best, were valuable only as a guide to management since products were generally produced and sold and services were rendered before cost figures were available.

The use of budgets has revolutionized cost accounting and has made it a preventive device to correct inefficiencies before they creep into business operations or as they are recognized from day to day. A good budget system shows the executive what he may expect in sales over the next few months; it permits the formulation of a production quota including the kinds and quantities of material, the number and classes of workers, the amount of overhead, and the equipment requirements; and it indicates the financial requirements needed to complete the budget plans. The budget system is a coordinated plan of action for every executive, salesman, and foreman which, by means of the cost system, can be compared with actual results monthly or more frequently.

Cost Accounting an Aid in Price Determination.—The general level of prices for products and services is determined by conditions of supply and demand in local, national, or international markets, but price lists of individual products or services must be prepared by executive decision after careful consideration of the cost of production and of competitive conditions. Cost conditions may prevent the profitable marketing of a product at existing prices, or it may be considered more profitable to set a price below prevailing market prices in order to obtain the resultant increase in volume of sales. The problem of properly regulating prices and output is dependent upon a knowledge of production, distribution, and administrative costs per unit of product or of service.

Since, in general, prices are determined by the forces of supply and demand and an entrepreneur can set his prices only to a limited extent, cost control is the only means by which a business may be insured against loss. If selling prices and costs can be predicted with reasonable certainty by budgetary methods, the businessman is in a position to increase or decrease his output, to change the character of his product, to lower

prices, or to regulate cost conditions in such a way as to realize maximum net profits. Cost accounting makes possible the accumulation of information concerning the business enterprise; the function of management consists in using the data to the best advantage.

Curtailment of Losses Due to Seasonal Conditions.—Seasonal variations in activities are responsible for higher costs and lower profits in many industries. It is a duty of the cost accountant to attempt to alleviate the situation by smoothing out the peaks and dips in production and sales activities. This can be accomplished indirectly by presenting to management figures showing costs and losses resulting from irregular employment of labor, machinery, and plant. Wastes in the use of materials, inefficiencies in employment of temporary labor, and losses caused by operating machinery and plant beyond normal capacity, all become apparent during periods of overcapacity production. Idle time of workers and machinery, costs of storing raw materials and finished products, unabsorbed overhead expenses, and a general decay in the morale of personnel, all result from subnormal plant operations. These inefficiencies can be vividly exhibited in cost reports.

The cost accountant can contribute directly to the stability of the business enterprise by showing the value of lowering prices and of increasing volume during off seasons. It may appear profitable for many concerns to follow the example of the soap industry and to plan a daily schedule of production throughout the year, producing quantities in excess of sales during the late fall, winter, and spring months, when sales are comparatively low, and producing less than the sales volume during the warm months of the year when the volume of sales is at its peak. Large inventories may mean an increase in the cost of warehousing and a loss through inactive working capital, but it is more than compensated for through economical use of labor and of plant facilities. The use of budgetary control, combined with cost accounting, has done much to bring about stability in industrial activity with benefits accruing to stockholders, to employees, and to society in general.

Cost Accounting and Expansion Policies.—Every business is constantly subject to changing internal cost conditions; some costs are increasing and others decreasing, even though production remains constant. Management also is puzzled by rapidly changing national and international conditions which, although external to the industry, have considerable effect on costs. In spite of these dynamic influences management must adopt policies to meet competition, develop new markets, contract or expand sales of particular products, buy new machinery, and build new plants.

The cost accountant is capable of making special investigations and of preparing reports to keep management advised of the relative advan-

tages and profitableness of one policy as compared with another. Past costs and estimated future costs can be used to determine whether it is economical and advisable to pioneer new markets or to meet competition with new products or methods in established territories. A good cost system should reveal the cost of operating equipment, indicate differences in the operating efficiency of various machines, and show to what extent new equipment would result in more economical operation.

Relations with Outside Agencies.—Banks and other credit agencies are becoming more hesitant in establishing a line of credit with business concerns that do not have cost accounting systems. The use of cost accounting technique permits accurate operating reports which can be analyzed by a credit man to determine present conditions and future trends. When a cost accounting system is in use, the monthly or quarterly accounting reports are increased in number. The balance sheet and the profit and loss statements are supplemented by comparative reports showing budget estimates and costs by divisions, departments, lines, units, territories, salesmen, and services. In addition there may be many special cost reports resulting from regular operations, or from special investigations within the plant or in the industry, and special reports prepared for each department such as sales, purchase, credit, engineering, traffic, and employment.

Federal and state tax returns and reports to governmental agencies, such as the Bureau of Internal Revenue and the Federal Trade Commission, are more easily prepared and more readily accepted when cost data are available. Detailed records in regard to payrolls and personnel facilitate the preparation of unemployment compensation and social security reports.

Perpetual inventory records for materials and finished stock and production orders for work in process form a better basis for securing insurance and for adjusting losses due to fire, theft, and accidents.

Trade associations are increasing in membership, largely owing to the promotional efforts of the Department of Manufacture of the United States Chamber of Commerce, the National Association of Manufacturers, and the National Association of Cost Accountants. Trade associations are instrumental in stimulating the use of cost accounting records and in the standardization of cost terminology and procedures; hence as a result cost data of individual companies are more accurately compared with others in the industry.

Value of Cost Accounting to Management.—The general accomplishments or advantages of cost accounting have been described, and all these features are important aids to management. Cost accounting is so closely allied to management that it is difficult to indicate where the work of the cost accountant ends and managerial control begins. In

general, it may be said that cost accounting is to serve management in the execution of policies and in the comparison of actual and estimated results in order that the value of each policy may be appraised and changed to meet future conditions.

An English writer[1] shows that cost accounting is an integral part of good management by stating:

> The nature of cost accounting may therefore be summarized as analyzing, recording, standardizing, forecasting, comparing, reporting, and recommending. It is the business of the cost accountant to fill in turn the role of historian, news agent, and prophet. As historian he must be meticulously accurate and sedulously impartial. As news agent he must be up to date, selective, pithy. As prophet he must combine knowledge and experience with foresight and courage.

Questions

1. What is meant by financial or general accounting? What general procedure is followed in determining periodic profit or loss?

2. In your own words give a definition of cost accounting. How does cost accounting differ in technique and procedure from financial accounting?

3. Is cost accounting limited in its application to certain industries and certain divisions? Explain.

4. What are the important limitations and deficiencies in financial accounting?

5. How does the classification of expenses for cost purposes compare with the classification of expenses in financial accounting for retail establishments? for manufacturing concerns?

6. Explain what is meant by a system of control of materials and supplies. What forms of "internal check" can be introduced to prevent misappropriation and waste of materials and supplies?

7. What types of control of wages and salaries are obtained with the establishment of a system of cost control?

8. What are meant by "standards" of efficiency? What types of "standards" are incorporated in a system of cost control?

9. List five expenses that are variable and controllable; name five fixed expenses. Of what value is such a classification of expenses?

10. Of what importance is budgeting in a system of cost control?

11. Of what value is cost information in determining prices and expansion or contraction policies?

12. Of what value is a cost accounting system to a business enterprise in its relations with governmental agencies and other business concerns?

[1] WILMOT, HAROLD, "The Cost Accountant's Place in Management," *The Cost Accountant* (England), October, 1936.

CHAPTER II

COST CLASSIFICATION AND CONTROLLING ACCOUNTS

Meaning of Classification of Accounts.—An important feature in the installation of any accounting system is the proper classification of accounts. By classification is meant a convenient arrangement of accounts properly related as to function with an established relationship between general ledger accounts and subsidiary records. In financial accounting systems a customary arrangement of accounts in a ledger is in accordance with the plan of compiling the balance sheet and the profit and loss statement for a particular concern. Thus it may be convenient to show Cash on Hand as the initial account, followed by such asset accounts as Cash in Banks, Accounts Receivable and Notes Receivable until the asset list is exhausted. Liability, capital, and surplus accounts follow in order, and profit and loss accounts beginning with Sales are scheduled in succession.

With the introduction of cost records, supplemental to financial accounts, the problem of classification becomes slightly more complex. The accounts composing the profit and loss elements are augmented to include general ledger accounts for each type of expense and in some cases for each service department, process, production department, and sales territory. In addition a number of subsidiary ledgers or records are necessary to record properly detailed cost information.

An essential part of the classification process lies in the selection of the most suitable account title for each account. The majority of account titles in financial accounting have become uniform through usage, but cost accounts are not so well standardized and identical information may have a variety of titles even in business concerns in the same industry. New types of transactions or changes in business methods frequently necessitate additional accounts or changes in the usage of accounts, either of which may lead to temporary confusion among the office personnel. Therefore a carefully designed and tested classification of accounts, which will require a minimum of changes, should be one of the first steps in the installation of an accounting system, especially of a cost system.

Classification by Symbols or Code Numbers.—Lengthy account titles generally have been replaced in accounting records by the use of code symbols or numbers. The substitution is made for two reasons.

If a code method is not used, the title of an account may have to be written many times before a single transaction is completed. For example, in the handling of material, the account titles may have to be written on such business records as the purchase requisition, the purchase order, the material received report, the voucher, the stores requisition, and the material returned report. Instead of writing an account title which may be misspelled or improperly classified because of its technical nature or of carelessness, it is more convenient to use a code system. A second reason is secrecy. Management frequently considers it a poor policy to permit the general office employees to know the nature of purchase, labor, and expense transactions which occur from day to day and which are summarized in the general and subsidiary ledgers. A transaction may be analyzed and coded by the comptroller or accountant when a code system is in force, while the posting and other clerical work may be done entirely in terms of symbols or numbers without clerks realizing the exact nature of the transaction.

When a code system is used, the classification of accounts exhibits for each account the title and code symbol or number assigned to it. Usually the comptroller retains a complete classification schedule and supplies each department head and division accountant with the accounts and code which relate to his particular work. In preparing a classification of accounts, it is customary to provide a chart of accounts which is composed of a list of the account titles and numbers which are to be used. The chart should contain the title and number or symbol assigned to each account; it should present an orderly arrangement of accounts which will be followed in the ledger and in preparing financial and cost statements; and it should be supplemented by a manual of instructions dealing with the proper use of accounts and records. The manual of instructions is an important part of an accounting system, since it contains a detailed description of the general ledger accounts and the supporting subsidiary records. Frequently important types of transactions are illustrated with the proper form of debit and credit entries made to each account.

The most commonly used plans of coding accounts are as follows:

a. The numerical system.
b. The decimal system.
c. The mnemonic system.
d. The combination letter and number system.

The Numerical System.—The use of numbers to represent general ledger accounts and subsidiary records is the simplest plan of symbolizing. One plan is to assign a number to each account, with some numbers omitted to provide for additional accounts and records. The method may be illustrated as follows:

Current assets:
1. Petty Cash
2. Cash in Banks
3. Accounts Receivable
4. Notes Receivable
5. Raw Material Inventories
6. Gasoline
7. Oil
8. Castings
Etc.
25. Finished Goods Inventories
26. Product A
27. Product B
Etc.
50. Investments
51. Prepaid Insurance
Etc.

Fixed assets:
75. Land
76. Buildings
77. Reserve for Depreciation of Buildings
78. Machinery
79. Lathes
80. Drills
Etc.
100. Trucking Equipment

The use of a straight numbering system has the advantage of simplicity, but, unless the proper quantity of numbers is omitted for each group of accounts, it is difficult to provide expansion and flexibility.

A slightly different plan is to assign a block of numbers to each major class of assets, liabilities, net worth accounts, expenses, and income accounts. The method may comprise the assignment of numbers 1 to 100 to current assets, 101 to 200 to fixed asset accounts and records, 201 to 225 to intangible assets, 226 to 300 to liability accounts, 301 to 350 to net worth accounts, 351 to 500 to expense accounts and supporting records, and 501 to 550 to income accounts.

A third plan is to separate controlling accounts and subsidiary records by means of dashes between numbers. For example, the Factory Overhead Expense account may be assigned the number 100 and a dash used to separate detailed subsidiary ledger expense accounts, allotted numbers from 1 to 50. If the Repairs account, subsidiary to the Factory Overhead Expense account, is assigned the number 12, a charge to the control and subsidiary would be indicated as 100–12.

The Decimal System.—The decimal system of classification is based upon 10 units of decimal numbers, ranging from 0 to 10. Numbers from 1 to 9 are assigned to general ledger accounts, while subsidiary

accounts and records are designated by the addition of a digit at the right. The method is illustrated as follows:

50. Selling Expenses:
    - 50.1 Salesmen's Salaries
    - 50.2 Commissions
    - 50.3 Advertising
    - 50.4 Printing
    - Etc.

51. Administrative Expenses:
    - 51.1 Executive Salaries
    - 51.2 Traveling Expenses
    - 51.3 Clerical Salaries
    - 51.4 Telephone and Telegraph
    - Etc.

55. Factory Overhead Expenses:
    - 55.1 Rent
    - 55.2 Taxes
    - 55.3 Depreciation
        - 55.31 Depreciation of Lathes
        - 55.32 Depreciation of Presses
        - 55.33 Depreciation of Boiler

The decimal method has the advantage of flexibility and of unlimited expansion. It is subject to criticism because it is complicated and the decimal points are easily misplaced or omitted, with the result that frequently charges and credits may be made to improper accounts and records. A variation of the decimal system is used frequently. The plan of using series of digits from 1 to 9 is followed, but decimal points are omitted.

The Mnemonic System.—This system employs key letters or symbols in coding accounts for the purpose of suggesting the nature of each account and record, thus aiding the memory of accountants and clerks who analyze and record transactions. The letter A may be used to represent asset accounts, L to signify liability accounts. Cash may be symbolized as C, material as M, with a type of material such as brass fittings as BF. Thus the purchase of brass fittings to be considered as an asset and charged to Materials account may be coded A-M-BF. The letters FE may be representative of the Factory Overhead Expense account, C may symbolize the Cutting Department and R suggest Repair Expense. Thus a transaction involving a repair expense chargeable to the general ledger account, Overhead Expense, and to the subsidiary account, Cutting Department, may be coded as FE-C-R.

A mnemonic system, which attempts to assign suggestive letters or combinations of letters to all accounts and records, is not readily adaptable to concerns with numerous accounts and records because it is difficult

to select suitable letters. The method is used most effectively when combined with a number system.

Combination Letter and Number System.—An effective plan of coding can be developed by means of combining the letter and number systems. Letters can be used to suggest controlling accounts, plants, branches, and divisions, and blocks of numbers can be assigned to subsidiary accounts and records. The following schedule suggests a possible arrangement of letters and numbers:

EXHIBIT 1

General ledger accounts	Code	Stockroom or department	Code	Subsidiary record classification	Code
Raw material....	M	Raw-material stockrooms	1-10	Raw-materials stock accounts	500-1000
Supplies.....	S	Supplies stockrooms	11-12	Supplies stock accounts	1001-2000
Labor.....	L	Production departments	15-35	Direct labor operations (cutting, grinding, etc.)	2001-2200
Factory overhead expense	FE	Service departments	36-50	Indirect labor operations (sweeping floors in machine shop, etc.)	2201-2500
				Overhead expenses (taxes, depreciation, power, repairs, etc.)	2501-2550

The classification code illustrated above is a combination of letters and numbers for four important controlling accounts and their subsidiary records in a manufacturing concern. If a raw material, ¼-in. copper wire, is purchased and assignable to the Copper Wire Stock account in stockroom 2, the code is M-2-501. A punch-press operation in production department 16, classed as direct labor, is coded L-16-2002. The payment of a repair bill for the trucking department, assigned to service department 37, is coded FE-37-2504.

Cost Terminology.—Cost accounting and financial accounting have, in general, a common terminology. There are, however, a number of terms, accounts, and records which are peculiar to cost accounting. It is in its infancy as compared with financial accounting and does not have a strictly uniform or universally accepted use of terms or classification of accounts. Cost accountants, public accountants, and executives are endeavoring, through trade associations, associations of manufacturers, the American Institute of Accountants, the United States Chamber of Commerce, the National Industrial Conference Board, and the National Association of Cost Accountants, to limit and standardize the terminology of cost accounting. Although progress is being made in this direction,

refinement in the use of terms still is in process; consequently the stu must be acquainted with varying expressions and meanings, many which are the result of common usage in factory and accounting office

Meaning of Cost.—Although business concerns differ in organizati when considered from the functional viewpoint, in general the following divisions may be noted:

a. Production (processing or putting product in salable state).
b. Distribution (sales of products or services).
c. Administration and financing.

Within each division the cost of an article, service, or department is the sum of the three elements entering into it: direct material costs, direct labor costs, and indirect or overhead costs.

Direct and Indirect Costs.—In the case of both material and labor, the cost accountant is faced with the practical problem of determining direct and indirect costs. If cost accounting could be recorded in infinite detail, costs which are usually treated as indirect charges could be identified sufficiently to warrant consideration as direct charges. For practical purposes, however, only material and labor which are easily and economically traceable to a product, service, or sale are considered to be direct cost. As costs are refined and cost systems accumulate more detailed information, many items of material and labor now classified as indirect costs will be presented as direct elements.

Direct Material Costs.—Direct materials are those materials and supplies which can be identified with the manufacture of a product or of a group of products in a manufacturing concern and with a sale or group of sales in a sales division. Materials may be considered a direct charge at one time, but an indirect or overhead charge on other occasions. Thus nails used in a box factory would be charged to Work in Process as a direct cost when used in production, but would be charged to Overhead Expense when used to repair the factory building.

The test for direct materials is that they must be accountable and traceable as they enter into the product, service, or sale. On this basis they are distinguished from indirect materials such as stationery, oil, and gasoline which are used for general administrative and manufacturing purposes and from repair parts and replacements which are required for equipment and buildings.

Direct Labor Costs.—Direct labor consists of the labor of employees which can be identified, as in the case of direct materials, with the manufacture of a product or group of products in a manufacturing concern and of a sale or group of sales in a sales division. Direct labor comprises workers such as drill-press operators, as distinguished from workers such as clerks, foremen, department he

workers. A worker may be performing direct labor for a certain number of hours, but be an indirect worker for the balance of the day. For example, enterprises frequently have general utility men who may be working on an assembly line or operating a machine as direct laborers for 4 or 5 hr. but later in the day may aid in repairing machinery or in doing clerical work as indirect workers.

Prime Costs.—The term "prime cost" is used commonly to denote the sum of direct material and direct labor costs in the production of a product. It is limited in its use to the manufacturing division of a business concern.

Overhead Costs.—"Overhead" is the term generally applied to those charges which cannot be identified directly with a unit, a production order, a service, or a department. Other terms frequently used for and interchanged with overhead are "indirect expenses," "burden," "supplementary costs," and "manufacturing expenses."

Distribution Costs.—Distribution costs include all costs incurred from the time the product has been put in a salable state until it is converted into cash. Thus they involve the functions of selling, storage, transportation, financing, credit, and collection. The major items of expense include advertising, selling expenses, packing, storage, transportation, financing, credit, collection expense, and sales administrative expense.

Administrative Costs.—Administrative costs include costs of planning and of controlling the general policies and operations of a business enterprise. Usually all costs which cannot be assigned either to the production or sales division are considered as administrative costs. Typical are such items as fees and expenses of the board of directors, the president's salary, the rent for general offices, and costs of the general accounting department.

Joint Costs.—When two or more products are processed at the same time, the problem arises as to the proper distribution of material, labor, and overhead costs among the various products. Likewise, when a number of different products are purchased from the same supplier and are received in the same freight shipment, there arises the problem of apportioning the proper amount of transportation, handling, and purchasing costs among the different goods received. Both of these situations present the problem of joint costs, which involves the use of equitable methods of cost allocation.

Distribution Bases for Cost Allocation.—An important feature of all cost systems is the distribution of indirect or overhead costs to units, orders, processes, departments, and territories in proportion to the amount of service rendered. Thus rent can be distributed on the basis of floor space; repair department expense on the basis of the hours of service given

each department; and general advertising expense can be apportioned to sales departments or territories on the basis of the net sales of each unit. Production department overhead expenses can be distributed to production orders on the basis of direct labor hours, direct labor cost, or machine hours. Distribution bases can be computed at the end of each accounting period or can be predetermined as a part of a system of budgetary control and standard costs.

Actual, Estimated, Normal, and Standard Costs.—The terms "actual," "estimated," "normal," and "standard" costs are frequently confused and incorrectly used. Actual costs consist of expenses incurred in the production, distribution, and administration of a business as shown by material requisitions, payrolls, and expense vouchers. Actual costs are accumulated daily and are summarized at the end of each accounting period.

Normal cost is deemed to be an average cost of production, sales, or service rendered during an accounting period. Normal cost is computed for the budget period, usually for a year, and is an average of monthly cost conditions, thus eliminating seasonal variances in production, sales, and expenses.

Estimated costs are costs predetermined at the beginning of an accounting period in an attempt to forecast actual costs. The estimates are used in preparing price lists and contract bids. They are constantly revised as variances occur between estimated and actual operations.

Standard costs represent the best estimate that can be made of what costs *should* be for material, labor, and overhead after eliminating inefficiencies and waste. Standard costs are subject to revision only when there has been a change in the price level of materials and labor, or when there has been an alteration in factory methods or in the use of machinery. Standard costs represent management's best measure of efficient plant operation.

Departmentalization.—One of the most important steps in the development of cost control is the proper division of the concern into departments. The term "department" has a distinctive meaning in cost accounting as compared with administrative concepts of the word. From an administrative point of view a department is a division of the business which permits the proper executive control of a specified number of men, of a continuous manufacturing process, or of a type of activity. In many cases the physical arrangement of a building or machinery is the basis for departmentalization. A department, as a cost accounting concept, is a division of a business enterprise in which a similar group of products are located, services are dispensed, similar machines are operated, or like kinds of work are performed. The important consideration, from a cost point of view, is the separation of the concern

into units or divisions in which similar cost conditions for material, labor, and overhead exist.

Both production departments and service departments are used as costing units in manufacturing concerns. Production departments are centers which contain a battery of the same or similar machines, a group of workmen performing the same operation or assembly; or they are divisions having similar material, labor, and overhead cost conditions. Service departments contain indirect workers and machines performing similar service in facilitating production and management activities, such as the superintendent's office, the repair department, and the janitor or building service department.

The division of any business into departments must be accompanied by the proper delegation of authority and responsibility, each department being under the supervision of a department head or foreman.

Cost Accounting Formula.—The objectives of the cost accountant in accumulating costs may be expressed for manufacturing concerns as follows:

Direct material + direct labor = prime cost.
Prime cost + factory overhead cost = manufacturing costs.
Manufacturing costs + distribution cost + administrative costs = cost to manufacture and to sell.
Net sales − cost to manufacture and to sell = profit or loss from operations.

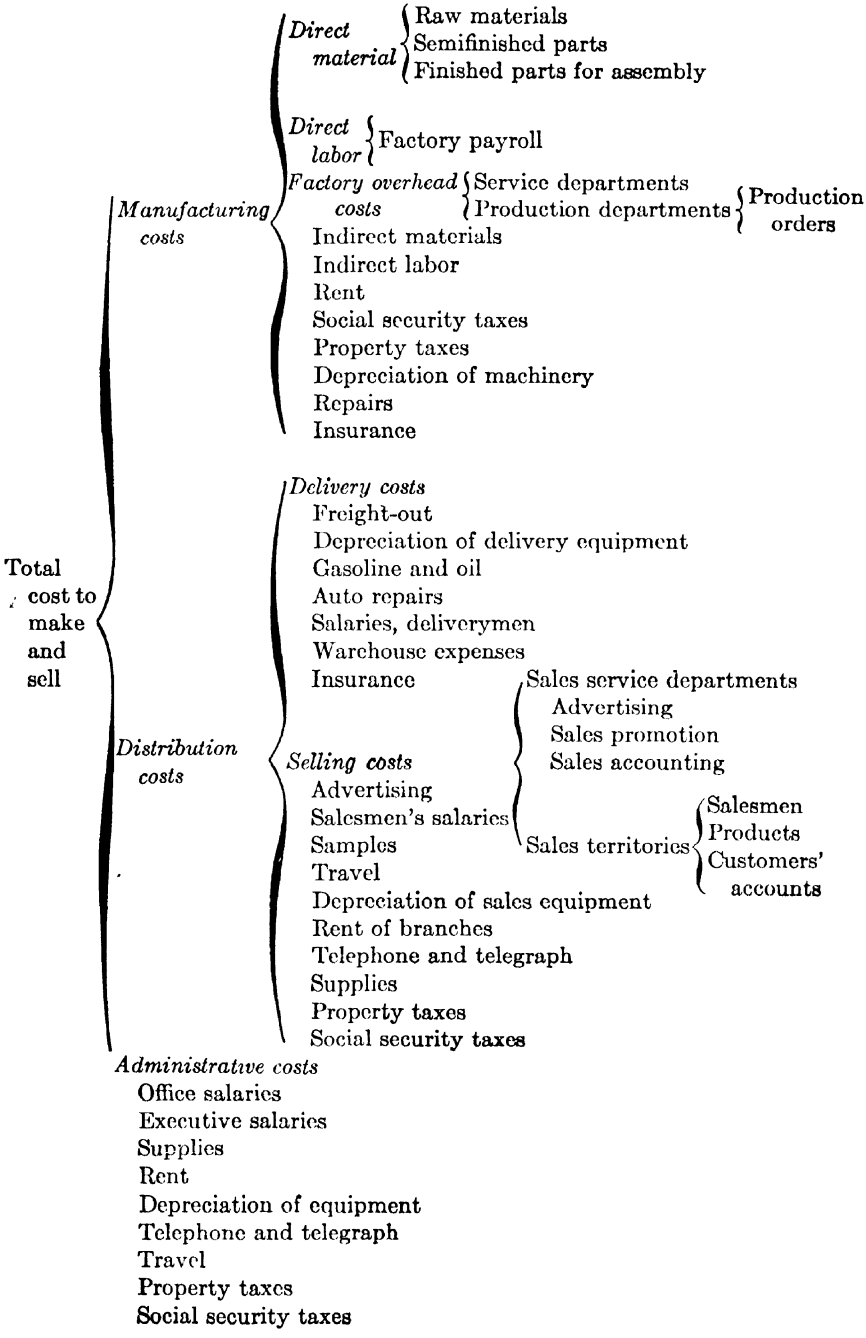
A chart of important expense accounts for a manufacturing enterprise is given as Exhibit 2.

General Use of Controlling Accounts.—Business transactions are numerous and varied in large business enterprises and warrant the use of many accountants and clerks in analyzing and recording transactions and in preparing reports. The establishment of a cost system increases materially the number of accounting records and the amount of analytical work. Obviously, with the growth of any business, it is an impossibility to record all transactions in accounts in the general ledger. The solution to the problem is the summarization of accounting information in controlling accounts in the general ledger and the recording of detailed cost data in subsidiary ledgers or records. Controlling accounts are ably defined and explained in connection with accounts receivable and accounts payable in elementary accounting texts; hence a detailed discussion is unnecessary.

The general ledger, from which are prepared the profit and loss statement and the balance sheet, is used to summarize classes of transactions in controlling accounts. Supporting each general ledger controlling account are one or more subsidiary ledgers or records in which business

EXHIBIT 2

CHART OF EXPENSE ACCOUNTS FOR A MANUFACTURING ENTERPRISE



transactions are recorded in detail as they occur. With a few exceptions all accounts exhibited in the financial statements prepared for large concerns are controlling accounts.

Plan for Operating Controlling Accounts.—The cost accountant is confronted frequently with the problem of advising management as to what cost controlling accounts should be shown in the general ledger, what data should be detailed in subsidiary records, and how the plan of using controlling accounts operates. A few general principles of controlling account-subsidiary relationships as found in cost accounting are suggested:

a. It is usually advisable to use a controlling account when there are 12 or more accounts of the same type appearing in the general ledger. Thus 12 or more overhead expense accounts and 12 or more production department accounts may warrant the use of a controlling account and subsidiary ledger for each group.

b. A controlling account with supporting subsidiary records is advantageous when the accounting system is decentralized, *i.e.*, when detailed accounting is done in factory offices or branches apart from the general accounting office.

c. Subsidiary cost records may be in a variety of forms: bound or loose-leaf ledger accounts, card files, columnar analysis sheets, and such business papers as time tickets, payroll sheets, production orders, and expense vouchers.

d. The plan of operation is to have an account in the general ledger designated as a controlling account for a group of accounts; subsidiary record forms are devised; daily transactions are analyzed and posted to subsidiary records either from detailed entries in journals or, more frequently, directly from original business papers such as invoices, payrolls, time tickets, and vouchers; postings of totals of the transactions of the period are made weekly or less frequently to the controlling account in the general ledger from journals or from summary statements of transactions; the balance of the controlling account is proved monthly or more frequently with the sum of the balances of the subsidiary records which it controls.

Advantages of Controlling Accounts.—The elimination of detailed accounts from the general ledger through the substitution of controlling accounts and subsidiary records has many advantages.

a. Controlling accounts are invaluable to management in policy formulation because they summarize masses of detailed information contained in subsidiary records.

b. Controlling accounts make possible a division of labor among clerks and accountants and a greater degree of specialization in work performed.

c. A system of internal checks exists through the use of controlling accounts because the work of one individual is checked against the work of others. This is an important factor in assuring accuracy, maintaining honesty, and detecting errors.

d. The use of controlling accounts permits the prompt preparation of financial statements at the end of each accounting period without waiting for all work to be done in balancing individual subsidiary ledgers.

e. Controlling accounts permit the general ledger to remain under executive control, and, since the accounting system is decentralized through the use of subsidiary records, costs and the financial position of the concern may be treated confidentially.

Important Cost Controlling Accounts.—Cost controlling accounts and supporting subsidiary records vary with the type of business enterprise and with the size of the concern. No attempt is made in the present chapter to exhaust all the possible controlling account-subsidiary record relationships. The more important controlling accounts and the types of subsidiary records which might be used are discussed briefly to illustrate how controlling accounts may be employed and to explain further the meaning of cost terminology.

The controlling accounts that generally are used in cost systems in all types of business enterprise, with special adaptations to fit requirements, are as follows:

Materials or Stores, and Supplies
Payrolls or Wages and Salaries
Overhead Expense
Plant and Equipment

Other cost controlling accounts which are used frequently in addition to the above accounts are as follows:

Manufacturing divisions: Work in Process, Finished Goods, Service Departments, Production Departments, and Applied Factory Overhead Expense.
Distribution or selling division: Sales Service Departments, and Sales Territories.

Material Controlling Accounts.—The controlling account that is almost universally used in connection with cost systems is the account for Materials or Stores. Since materials and supplies are usually purchased in quantities of hundreds or even thousands of classes or types of items, one or more controlling accounts in the general ledger with supporting subsidiary ledgers are necessary. In order that daily control may be exercised over materials and supplies, a system of perpetual inventories is used. Its operation consists of making entries in summary form to the general ledger controlling account and in detail to stock ledger accounts in the subsidiary ledger. The authority and amount of these entries arise from purchase invoices or vouchers for receipts and from requisitions drawn on the stockkeepers for materials consumed. The stock ledger accounts are used to record both quantities and values of goods ordered, received, and issued at cost price, so that the balance of each account is available at all times.

A form of subsidiary ledger sheet and other supporting business papers, such as purchase requisitions, purchase orders, material received reports, material purchase vouchers, and material requisitions, are illustrated and discussed in Chap. IV.

Payroll Accounts.—Payroll accounts appear in general ledgers as controlling accounts under several different classes, the type and number of which depend on the size and type of business. There may be one con-

trolling account for Payrolls which controls all types of employees' compensation, or there may be controlling accounts for separate classes of wages and salaries such as Factory Payroll, Sales Salaries, Administrative Salaries, and Executive Salaries.

Subsidiary records consist of time tickets or daily time reports which are summarized in payroll sheets prepared weekly or semimonthly for departments and territories. They are illustrated and discussed in Chap. VI.

Overhead Accounts.—Three overhead expense controlling accounts, *viz.*, Factory Overhead Expense, Selling Expense, and Administrative Expense, are commonly used in the general ledger of manufacturing concerns. Each of these accounts controls a group of indirect expenses classified by kind, such as depreciation, repairs, taxes, indirect wages, and salaries.

The subsidiary ledger supporting each account usually consists of a series of analysis sheets or columnar ledger forms commonly termed "standing orders." The title standing orders is employed because each analysis sheet or account has a name and a code symbol, such as Depreciation—machinery, 1050, which remains unchanged until a new classification of accounts is prepared. This group of unchanging records may be contrasted with production orders, which exist as active subsidiary records only until the production of a particular order is completed. The term standing orders is used in this text to refer to the subsidiary records for overhead expense controlling accounts.

Plant and Equipment Accounts.—In manufacturing concerns, plant equipment and machinery constitute an important and numerous group of assets which warrant the use of one or more controlling accounts in the general ledger supported by subsidiary accounts or cards exhibiting the original cost, expected life, depreciation allowance, and present book value of each item or group of equipment.

Departmental Accounts.—In cost accounting, in order to allocate properly the overhead expenses to lines of products, production orders, types of service rendered, and salesmen, it is necessary to insert an intermediate step in the distribution. In manufacturing concerns it is feasible to classify indirect expenses by service and production departments, and in selling divisions by service departments and territories. The classification of indirect costs by departments informs management of the cost of maintaining each departmental function.

If there is not too great a number of service departments, such as personnel, employment, accounting, welfare, building service, and trucking, it is advantageous to have an account for each department in the general ledger. Each service department account may be supported by a subsidiary analysis sheet which shows in detail the amount of such

overhead expenses as salaries, supplies, depreciation, rent, and taxes charged to the department. If the departments are too numerous, a single controlling account termed Service Departments may be maintained in the general ledger, and the costs of each department may be shown on a separate departmental sheet.

Work in Process Accounts.—Work in process accounts are used in manufacturing concerns to control work as it progresses by stages through production processes. One Work in Process account may be used to control the three cost elements of direct material, direct labor, and applied factory overhead expense, but a more satisfactory arrangement is obtained when three controlling accounts, Materials in Process, Labor in Process, and Factory Overhead Expense in Process, are used to record cost elements in the general ledger separately.

Production orders or cost sheets are used as subsidiary records subordinate to the single Work in Process controlling account or the three Work in Process controlling accounts. A production order is originated for each job or group of like jobs and is utilized as a recording medium at each stage of production for the cost elements applied to the particular job. Examples of production orders are given in Chap. IX.

The Finished Goods Account.—Manufacturing concerns usually have an account in the general ledger termed Finished Goods to control goods which have been finished and remain in finished goods stockrooms. The finished stock ledger accounts in the subsidiary ledger are similar in form to the materials accounts in the subsidiary stock ledger and contain the number of units, unit cost, and total cost of goods finished in received, issued, and balance sections.

In place of a single Finished Goods controlling account there may be a number of controlling accounts, one for each class of finished product with a supporting specialized subsidiary ledger. Frequently there are one or more controlling accounts for Finished Parts, with finished parts subsidiary ledgers as detailed supporting records.

The Factory Ledger.—An extreme in the consolidation of a mass of heterogeneous cost data in a single account in the general ledger is found in the occasional use of the factory ledger in manufacturing concerns. Instead of having important cost controlling accounts in the general ledger, they are subjugated to an auxiliary ledger which is known as the factory ledger. This ledger is in an intermediate position, the upper level of cost accounting information being the general ledger, the lower level being subsidiary records such as stock ledgers, production orders, payroll records, factory overhead expense standing orders, and the finished goods ledger.

One plan of operation is to have all the cost accounts, which ordinarily appear in the general ledger, segregated in the factory ledger which is kept

in the cost accounting office in the factory. An account termed the Factory Ledger is maintained in the general ledger as a controlling account for all the cost accounts in the factory ledger. In the factory ledger there is a counterbalancing account entitled General Ledger. All plant accounts such as Factory Buildings, Machinery, Equipment, and Reserve for Depreciation are kept in the general ledger. All cash receipts, disbursements, and adjusting entries are recorded in the general accounting office in the books of original entry, such as the general journal, cash receipts journal, voucher register, and check register. Entries are made in the cost accounts in the factory ledger from duplicate copies of the purchase vouchers, expense vouchers, and journal vouchers, all of which may be sent to the cost accounting department from the general office. Summary cost information originating in the factory is in turn transmitted to the general office. The Factory Ledger controlling account in the general ledger should have the same balance as the General Ledger account in the factory ledger because, whenever any transactions involve both the general office and the factory, the same amounts are entered in both summary accounts. Thus, if the Factory Ledger account in the general ledger has a debit balance of $50,000, the General Ledger account in the factory ledger should have a credit balance for the same amount. The Factory Ledger account is credited and Cost of Goods Sold is debited for the cost of goods sold.

The use of the factory ledger is advantageous when the factory is some distance from the main office, or when there are several factory branches. This system does provide a means of testing the total debits and credits of transactions involving both sets of accounts, but no important cost information can be obtained directly from the general ledger by management for control and administrative purposes. Any account in the general ledger which summarizes such widely dissimilar cost information as is recorded in cost accounts in the factory ledger has very little statistical value. Of course, cost and statistical information can be obtained from the factory in the form of regular or special reports.

Questions

1. What is a classification of accounts? Why is it an important part of every system of accounting?

2. How does the classification of accounts differ when a system of cost accounting is combined with a system of financial accounting?

3. Why are accounts frequently classified by symbols or code numbers?

4. Explain briefly how a classification of accounts can be prepared by each of the following plans of coding accounts:

a. The numerical system.
b. The decimal system.
c. The mnemonic system.
d. The combination letter and number system.

5. Explain why cost accounting terminology is not so uniform and standardized as that used in financial accounting. What agencies are endeavoring to standardize cost terminology and unify cost accounting methods.

6. Define or explain briefly the meaning of each of the following cost accounting terms:

a. Direct material costs.
b. Direct labor hours and direct labor cost.
c. Prime cost.
d. Overhead or indirect costs.
e. Distribution costs.
f. Administrative expenses.

7. What are joint costs? Mention several industries in which the problems of joint costs are of prime importance.

8. What is meant by budgetary control? Why is budgeting an important part of cost accounting?

9. Differentiate between actual costs, estimated costs, and standard costs.

10. What is meant by departmentalization as applied to cost accounting methods? How does the concept of a department for cost purposes differ from the meaning of the term from an administrative point of view?

11. Give the cost accounting formula for a manufacturing enterprise.

12. Give three examples of controlling accounts used commonly in financial accounting. Describe the subsidiary record or records which each might control.

13. If you were requested by the management of an industrial concern to give advice as to the use of controlling accounts, what information would you give in regard to the following questions:

a. Under what circumstances is it advisable to replace a group of general ledger accounts with a controlling account?
b. What types of subsidiary records can be used in support of controlling accounts?
c. How can business transactions be posted both to a controlling account and to subsidiary records without throwing the trial balance out of balance? Will total debits be equal to total credits?
d. If the subsidiary ledger is out of balance with the controlling account, how may the error or errors be detected?

14. Enumerate the important advantages of the use of controlling accounts.

15. What are the important types of cost controlling accounts?

16. Explain how the Materials account and materials stock ledgers may be used as a controlling account-subsidiary record for controlling materials and supplies in a manufacturing concern.

17. Describe briefly the type of subsidiary record or records used in support of each of the following controlling accounts in manufacturing concerns:

a. Payrolls.
b. Factory Overhead Expense.
c. Plant Equipment and Machinery.
d. Repair Department.
e. Work in Process.
f. Finished Goods.

18. What is the factory ledger, and how is it operated? What are the advantages and disadvantages of using the factory ledger in manufacturing enterprises?

Problem 1

Classify each account under the following headings and prepare a code classification in accordance with the straight numerical system.[1]

[1] Some accounts may be classified under two or more headings.

I. Divisions.
   A. Manufacturing.
   B. Distribution.
   C. Administration.
II. Direct and indirect charges.
   A. Direct material.
   B. Direct labor.
   C. Overhead costs.
      1. Fixed charges.
      2. Variable charges.

Advertising
Rent of branches
Factory supplies
Freight-in
Executive salaries
Travel expense
Direct factory labor
Repairs to machinery
Power
Commissions
Defective work
Spoiled work
Building service expense
Superintendent's office expense
Packing expense
Cost department expense
Heat
Legal expense
Trucking expense
Inspection expense
Demonstration expenses
Indirect labor
Loss on bad debts
Payroll department expense
Salary of sales manager
Directors' fees
Direct factory material
Depreciation of factory equipment
Freight-out
Defective work
Telephone and telegraph
Taxes
Clerical salaries
Printing expense
Auditing expenses
Salaries of foremen
Salary of the president
Accident and compensation insurance
Experimental work
Testing incoming materials
Depreciation of display fixtures
Interest paid
Donations
Light expense
Subscriptions
Factory maintenance
Welfare department expense
Collection expense
Inventory adjustment
Postage

Problem 2

The following accounts appear in the general ledger of a manufacturing concern. Rearrange the accounts so as to constitute a suitable classification of accounts under appropriate balance sheet and profit and loss statement main and subheadings. Indicate a plan of coding these accounts by the mnemonic system.

Capital stock
Notes payable
Good will
Insurance expense
Reserve for depreciation of machinery
Rent
Depreciation of office equipment
Taxes expense
Raw material inventory
Direct labor
Cash
Taxes payable
Finished goods inventory
Indirect labor
Advertising expense
Power and light expense
Accounts receivable
Work in process inventory

Reserve for bad debts
Machinery
Sales salaries
Interest expense
Directors' fees
Telephone and telegraph
Surplus—earned
Sales
Petty cash
Gasoline and oil
Office supplies on hand
Heat
Bonds payable
Accrued wages payable
Dividends payable
Salaries—clerks
Discounts on purchases
Reserve for depreciation of office equipment
Patterns and drawings
Accounts payable
Notes receivable
Office equipment
Depreciation of machinery
Spoiled work expense
Inventory of scrap
Freight-in
Traveling expense
Executive salaries
Sales commissions
Factory supplies on hand
Repairs to machinery
Selling expenses
Freight-out
Purchase returns
Donations
Purchases
Tool expense

Problem 3

Classify each account under the following headings and prepare a code system according to the combination letter and number plan.[1]

Material
Factory labor
Manufacturing overhead
Selling expense
Delivery expense
General administrative expense

Office salaries
Sugar
Extract
Factory payroll
Rent
Building repair and maintenance
Color
Salesmen's salary and commission
Traveling expenses
Acid
Sirup
Depreciation on building
Taxes
Drivers' wages
Truck licenses
Miscellaneous general expenses
Depreciation on furniture and fixtures
Legal and accountant fees
Advertising
Bottle breakage
Truck tires
Stationery and office supplies
Samples
Labels
Paste
Insurance
Depreciation on machinery and equipment
Light and power
Water
Telephone and telegraph
Heat
Machinery repairs
Gas, oil, and grease
Garage rent
Freight on goods out
Insurance and bond premiums
Truck repairs
Factory superintendent
Freight on empties in
Paint and repair cases
Carbonic gas
Truck depreciation
Depreciation on cases

[1] Several expense accounts may be classified under two or more headings.

Problem 4

Prepare a classification of accounts for the Champlin Manufacturing Co. showing the controlling accounts and supporting subsidiary record accounts that you would recommend. Arrange the controlling and subsidiary accounts orderly under suitable balance sheet and profit and loss statement main and subheadings. Prepare a code classification for the accounts in accordance with the decimal system.

Cash—First National Bank
Cash—Second National Bank
Cash—Exchange National Bank
Cash—Peoples State Bank
Common capital stock
Materials—gasoline
Materials—oil
Materials—part A
Materials—part B
Etc.
Notes receivable
Taxes expense
Reserve for bad debts
Depreciation expense
Machinery and equipment
Building
Accounts receivable A
Accounts receivable B
Accounts receivable C
Etc.
Office supplies expense
Work in process inventory—Dept. 1
Work in process inventory—Dept. 2
Work in process inventory—Dept. 3
Etc.
Selling expense—advertising
Selling expense—travel
Selling expense—entertainment
Selling expense—catalogues
Selling expense—telephone and telegraph
Selling expense—freight-out
Reserve for amortization of patents
Sales discounts
Insurance expense
Investments
Surplus
Salaries—executive
Salaries—clerical
Salaries—truckers
Salaries—sales personnel
Salaries—factory workers
Finished stock—product X
Finished stock—product Y
Finished stock—product Z
Etc.
Reserve for depreciation—machinery and equipment
Tools expense
Repairs to building
Repairs to compressors
Repairs to motors
Repairs to trucks
Repairs to scales
Miscellaneous repairs
Accounts payable—M Co.
Accounts payable—N Co.
Accounts payable—O Co.
Etc.
Finished goods inventory
Power and light
Sales
Reserve for depreciation of building
Directors' fees
Dividends payable
Prepaid insurance
Patents
Legal fees
Bonds payable

CHAPTER III

BOOKS OF ORIGINAL ENTRY—THE VOUCHER SYSTEM

Types of Records of Original Entry.—The cost accountant is interested primarily in the origin and disposition of cost items and of purchase elements. Cost information may be obtained directly from original business forms (such as purchase orders, invoices, and material requisitions), from records of original entry, and from general ledger accounts. The type of records used for entering transactions is of concern to the cost accountant because he is interested in securing cost data in the most complete and economical manner, with an adequate internal check in operation as a preventative from fraud, carelessness, and unnecessary expenditure. Some form of journal or record of original entry should be a part of every accounting system in order to make possible the analysis of each business transaction and to give it a permanent chronological record.

In general, two systems of recording cost transactions are recommended:

a. Columnar purchase and cash disbursement journals.
b. The voucher system.

The first system of original entry may be found in a few small concerns, but the voucher system is rapidly becoming the practice where cost systems are being operated.

Purchase and Cash Disbursement Journals.—The purchase journal and the cash disbursement journal can be adapted to the use of controlling accounts in the operation of a cost accounting system so as to make possible a division of clerical and accounting labor, to effect economy in posting through the use of special columns, to assure a system of internal check, and, from a managerial point of view, to secure a division of authority and responsibility.

A columnar arrangement of the purchase journal is used to classify purchases by types. To each Debit column may be assigned a controlling account with supporting purchase records. Posting to subsidiary ledgers is possible from the purchase journal through the use of code numbers.

Exhibit 3 shows a columnar purchase journal for a concern manufacturing both wood and paper boxes.

The cash disbursement journal, used to record all payments made by check, can be arranged so as to have columns for types of transactions which occur frequently and a Sundry column for unusual transactions.

EXHIBIT 3
IDEAL BOX FACTORY
PURCHASE JOURNAL

Date	Explanation	Terms	L.F.	Invoice No.	Accounts payable Cr.	Purchases													
						Lumber		Paper stock		Hardware		Office supplies		Factory supplies		Sundry			
						Code	Amount Dr.	Code	Amount Dr.	Code	Amount Dr.	Code	Amount Dr.	Code	Amount Dr.	Code	Amount Dr.		

EXHIBIT 4
AMERICAN MANUFACTURING CO.
CASH DISBURSEMENT JOURNAL

Date	Explanation	Check No.	Cash Cr.	Purchase discount Cr.	L.F.	Accounts payable Dr.	Payrolls Dr.	Supplies		Factory overhead expenses		Selling expenses		Administration expenses		Sundries		
								Code	Amount Dr.	Code	Amount Dr.	Code	Amount Dr.	Code	Amount Dr.	Account	L.F.	Amount Dr.

Purchase columns for cash purchases are not ordinarily included, since it is a strict policy of the majority of companies that all purchases must be entered in the purchase journal and no cash purchases are to be made except through the petty cash system. A form of cash disbursement journal prepared for a small manufacturing concern is exhibited in Exhibit 4.

The Voucher System.—In business concerns having transactions dealing with purchases of materials, supplies, and various expenses such as payrolls, manufacturing, selling, and administrative expenses, the responsibility for disbursing funds and for incurring obligations should be determined, and a system of internal check should be in operation. The most effective system of control yet devised is the voucher system. It is universally in use in governmental and institutional units and is favored by accounting practitioners for all types of business concerns large enough to have a division of labor in the handling of funds and accounting records.

The voucher system involves the use of a series of checks and balances. When contracts and purchase orders are being prepared and large sums are disbursed daily, the checking and authorization of such business transactions by a number of clerks and officials are essential to good management. The voucher system is a method of handling, recording, and paying obligations through the use of vouchers which must be approved formally by the proper officials. The voucher system is an expansion of the purchase and cash disbursement journal methods of recording obligations and disbursements. The purchase journal is enlarged and renovated into the voucher register, which is designed to record all charges to purchases and expense accounts, while a cash disbursement record known as the "check register" is used in connection with the voucher register for the purpose of recording all disbursements.

A distinctive feature of the voucher system is the exacting requirement that all disbursements must be made by checks properly supported by approved vouchers. If small cash payments are necessary from time to time, a petty cash system can be operated to cover cash purchases of either commodities or services.

Voucher Forms.—The heart of the voucher system is the voucher. Vouchers are business papers which contain the salient facts of business transactions and which authorize payment for an expenditure. Vouchers are not uniform and differ in design in accordance with the type of concern and the form of voucher register used. The voucher may be prepared to include a complete list of the items purchased or service rendered, but, more frequently, in order to avoid listing pages of items as shown on invoices, reference is made to the invoices and to other business papers, and only a brief résumé of the nature of the obligation is given. Terms

and purchase discount may be recorded on the voucher when it is prepared, if the policy of the company is to take advantage of all discounts offered. A distribution of Accounts to Be Charged section is included on either the front or reverse side of the voucher; generally at the bottom of the form is the Approval section, with space for the signatures of clerks and executives who have checked the mathematics and the propriety of the obligation.

Voucher No._____ $_____

Date_____

PAYABLE TO

Distribution	Amount
Total	

Approved_____

Exhibit 5.—Voucher jacket.

Several types of vouchers are in use. One form, illustrated as Exhibit 5, is known as the "voucher jacket." It is a jacket in which an invoice may be folded or to which the invoice and other supporting papers may be attached. It contains the voucher number, amount, date, payee, account or accounts to be charged, and approvals.

A second form of voucher, illustrated as Exhibits 6 and 7, may be prepared when the invoice and other business papers in support of an expenditure are assembled.

A third form, which is a combination of a voucher and check, known as the "voucher check," is receiving favorable attention and use. A voucher and a check of regulation size are included as a single sheet of paper. The voucher and voucher check may be prepared at the same time, or, since the problem of discounts cannot always be determined until the actual disbursement is to be made, it is more common to record only informational data such as the voucher number, invoice number, and payee on the voucher check when the voucher is prepared. The voucher and voucher check combination form is usually designed so that it can be prepared with one insertion in a typewriter. The check, which has a

detachable statement with such information as invoice numbers, voucher number, amount of the invoice, and discounts taken, is sent to the creditor. He may deposit the check and keep the voucher form for his file.

VOUCHER

Purchase order No._____

Voucher No._____

Check No._____

Date paid_____

Payee_____

Address_____

Terms_____ Due date_____

Date	Invoice No.	Description	Account No.	Price	Amount

nent records. An illustration of a voucher check is given as Exhibits 8, 9, and 10.

Assembly of Business Papers for Vouchering.—A detailed description of various business papers required for purchase and expense transactions is given in Chapter. IV, but mention of their incorporation as a part of the voucher system is necessary at this point. Purchases and services received are not recognized as liabilities until vouchers are properly prepared and signed by designated officials. The preparation of vouchers with the required supporting business papers is an important clerical task. A voucher is prepared for each obligation that is to be entered as a separate charge in the voucher register. The voucher may represent a single invoice or may include a number of invoices payable to the same creditor, if the invoices are all to be paid on the same date.

Voucher No._____ $_____

Check No._____ $_____

Date

Name

Address

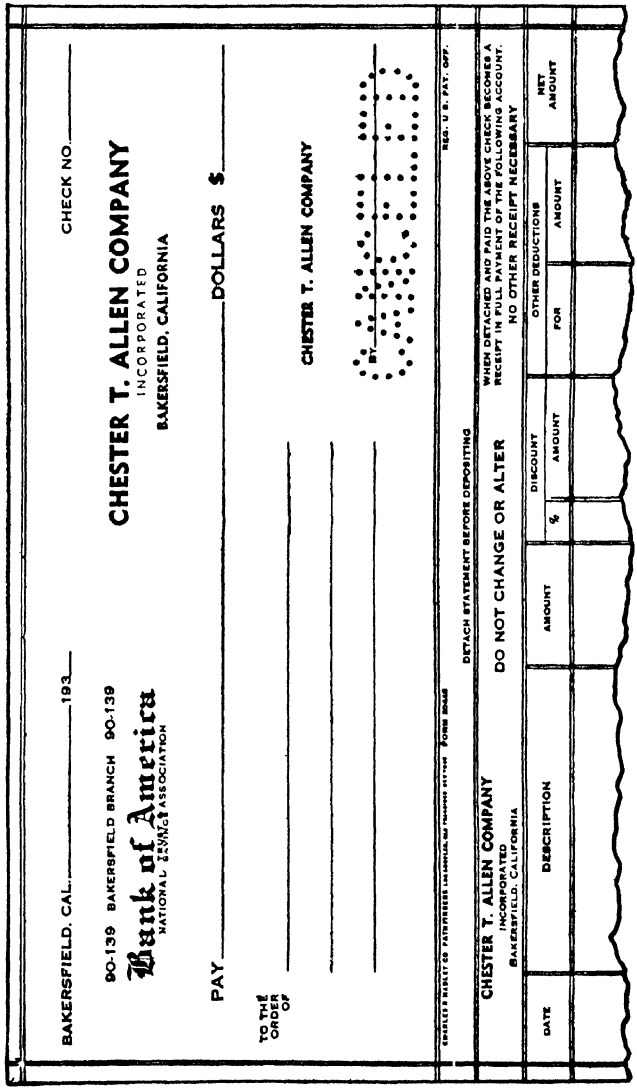
Account charged	Code No.	Amount
Materials		
Supplies		
Payroll		
Factory overhead		
Selling overhead		
Administrative overhead		
Machinery and equipment		
Building and equipment		
Delivery equipment		
Total		

Exhibit 7.—Reverse side of Exhibit 6.

Before a purchase voucher is ready for signatures, one plan is to attach to it a copy of each of the following forms: purchase requisition, purchase order, receiving report, testing report (manufacturing concerns), and invoice. In some concerns, in lieu of copies of these various forms, initials of representatives of purchasing, receiving, testing, and accounting departments are recorded on the invoice as it is checked in the individual departments. Thus, when the assembly clerk prepares the voucher, he has in support of this instrument copies of business forms or signatures certifying to the fact that the materials or services were properly requisitioned for purchase; that they were in accordance with the quantities and prices specified in the contract or purchase order; that they met the specifications as to quality; that

shipment instructions were followed; and the terms of payment with proper discounts were listed.

The voucher with its supporting papers may be checked for mathematical accuracy on a calculating machine and then may be ready for


BAKERSFIELD, CAL. _____ 193_ CHECK NO. _____

90-139 BAKERSFIELD BRANCH 90-139

Bank of America
NATIONAL TRUST & SAVINGS ASSOCIATION

CHESTER T. ALLEN COMPANY
INCORPORATED
BAKERSFIELD, CALIFORNIA

PAY _____ DOLLARS $ _____

TO THE ORDER OF _____

CHESTER T. ALLEN COMPANY

BY _____

DETACH STATEMENT BEFORE DEPOSITING

CHESTER T. ALLEN COMPANY
INCORPORATED
BAKERSFIELD, CALIFORNIA

DO NOT CHANGE OR ALTER

WHEN DETACHED AND PAID THE ABOVE CHECK BECOMES A RECEIPT IN FULL PAYMENT OF THE FOLLOWING ACCOUNT. NO OTHER RECEIPT NECESSARY

DATE	DESCRIPTION	AMOUNT	DISCOUNT %	DISCOUNT AMOUNT	OTHER DEDUCTIONS FOR	OTHER DEDUCTIONS AMOUNT	NET AMOUNT

Exhibit 8.—Voucher check (original copy)

executive approvals. Vouchers for various classes of purchases or services are routed differently. Vouchers for purchases usually require the signatures of the purchasing agent, the department head responsible for initiating the purchase requisition, and the comptroller or chief

accountant. Each official adds his approval, and the comptroller or chief accountant or an assistant inserts in the Distribution section the controlling account or accounts to be charged when the obligation is entered in the voucher register. He is the only one of the many employees

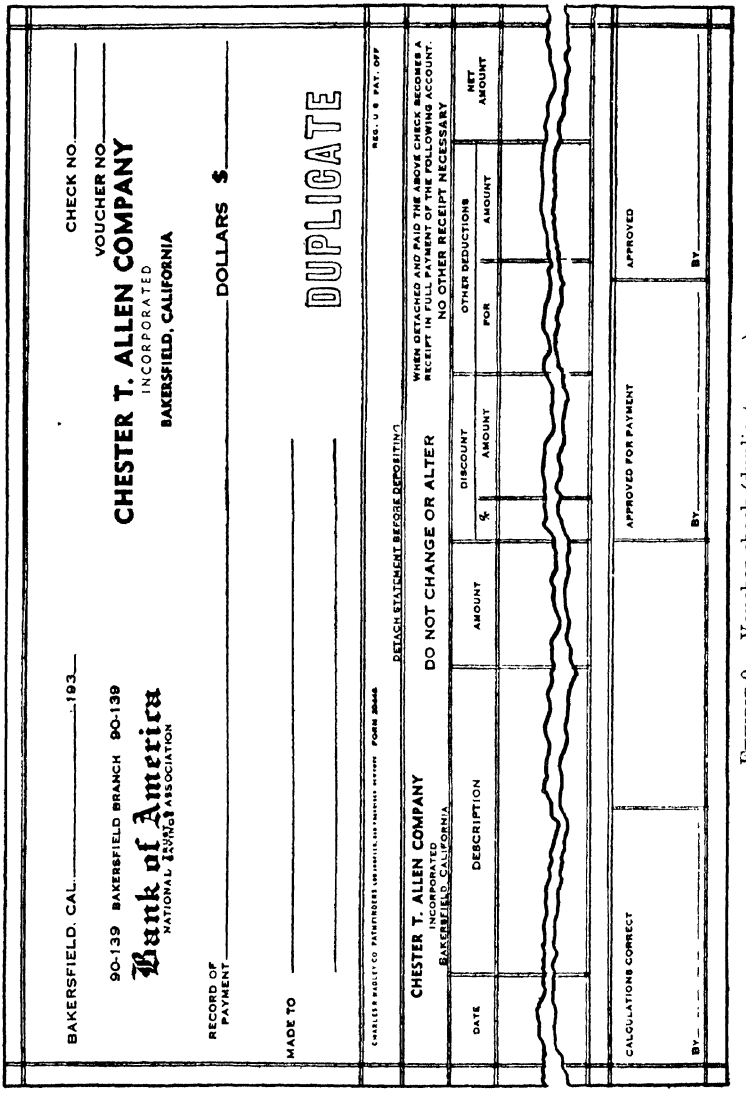


EXHIBIT 9.—Voucher check (duplicate copy).

handling the voucher and its supporting papers who is required to have a knowledge of accounting. He specifies the controlling accounts and subsidiary records to be charged through the use of account titles, code symbols, or both.

Vouchers for obligations other than purchases such as payrolls, rent, utility bills, and repairs are prepared and approved in a similar manner.

VOUCHER NO._____

DATE_____

IN FAVOR OF

DISTRIBUTION

ACCOUNT	DETAIL	V	AMOUNT	V

EXHIBIT 10.—Voucher check (reverse side of duplicate copy, Exhibit 9).

After payrolls are prepared and checked by the payroll department, they are attached to a payroll voucher and are approved by such officials as the paymaster, department heads responsible for the work done, and

EXHIBIT 11
NOVELTY MANUFACTURING COMPANY
VOUCHER REGISTER

Date	Explanation	Terms	Vo. No.	Paid		Vouchers payable	Raw materials		Factory supplies		Payrolls	Factory overhead expenses		Selling expenses		Administration expenses		Machinery and equipment		Sundry		
				Ck. No.	Date	Cr.	Code	Amount Dr.	Code	Amount Dr.	Amount Dr.	Code	Amount Dr.	Code	Amount Dr	Code	Amount Dr	Code	Amount Dr.	Account	L.F.	Amount Dr.

the comptroller, who analyzes the payroll on the basis of direct and indirect charges preparatory to entry in the voucher register. Vouchers for current expenses are supported by utility bills, rent statements, and repair invoices which are checked against contracts and agreements, are approved by such officials as department heads and the building superintendent, and are distributed to the proper controlling account for entry in the voucher register by the comptroller.

The Voucher Register.—The voucher register, as an adaptation of the use of special journals and a substitute for the columnar purchase journal and cash disbursement journal, contains columns to provide for entry of obligations incurred. Voucher registers have three important sections:

a. Description section, which includes Date, Voucher number, Creditor or Payee, Explanation, and Terms of payment.

b. Paid section, which shows date of Payment, Check number, and Check register folio reference.

c. Accounting distribution section, which includes columns for important purchase and cost controlling accounts with sundry account columns for inactive accounts.

The voucher register has only one credit column, Vouchers Payable, which is a current liability account; all the remaining money columns, with the exception of the Sundry section in which account titles are written in, are headed with account titles for assets and cost accounts.

Exhibit 11 is a voucher register for a manufacturing concern.

Entries in the Voucher Register.—After vouchers have been properly prepared and authorized, the appropriate data are entered in the voucher register. The most common plan is to enter the gross amount of the liability as a credit to Vouchers Payable, with debits being made to various purchase and cost controlling accounts. Any cash discounts to be taken are entered in the check register or cash disbursement book at the time the check is written.

The columns in the voucher register may be totaled and posted to controlling accounts monthly or as frequently as once a week.

The Vouchers Payable Subsidiary.—An advantage usually attributed to the use of the voucher system is the economy made possible through the elimination of an accounts payable subsidiary ledger. The subsidiary record commonly used in support of the Vouchers Payable account in the general ledger is the unpaid voucher file. After vouchers have been entered in the voucher register, they are filed by number, or occasionally according to creditors, in an unpaid voucher file.

The complete elimination of an accounts payable record is impractical in companies having a large number of unpaid vouchers, many of which are payable to the same creditor. The unpaid voucher file does not disclose the total amount owed each creditor unless the vouchers are summarized and classified. To offset this difficulty, some concerns maintain a regular accounts payable ledger in addition to the unpaid voucher file. As a substitute for a complete accounts payable ledger, it is possible to use a supplementary file to facilitate the use of the unpaid voucher file as a subsidiary record. An alphabetical file of duplicate vouchers can be maintained to show transactions with each creditor; a card file exhibiting voucher numbers and amounts for each creditor can be used; or a third possibility is a card file by creditors showing the voucher numbers for each creditor.

The unpaid voucher file is supplemented with a tickler card system so that vouchers can be pulled in accordance with the terms of credit and of the discount period. Vouchers which have been delayed in preparation or in securing approvals are usually marked "rush" through a sticker or a special memorandum so as to be rushed through the formality of entry in the voucher register and the subsidiary records to the disbursing officer for payment within the discount period. When given special attention, invoices usually can be vouchered, the voucher approved, entered in the voucher register, and the disbursement check prepared in a few hours.

The Check Register.—The disbursing officer or cashier receives vouchers with the necessary supporting papers either directly after entry in the voucher register or from the file clerk in charge of the unpaid

voucher file. It is the responsibility of the disbursing officer to check approvals and supporting papers authorizing payment of the voucher, to enter the voucher in the check register or cash disbursement journal, and to prepare the check in payment of the voucher for mailing.

The check register is a simplified cash disbursement journal which requires only three posting columns because charges to purchases and expense accounts are made in the voucher register. One debit column, Vouchers Payable, and two credit columns, Purchase Discount and Cash, are the posting columns necessary. In lieu of one Cash credit column, two or more columns, one for each depository bank upon which checks may be written, are frequently substituted. Therefore there may be such columns as First National Bank, Second National Bank, and First State Bank. A form of check register is given in Exhibit 12.

EXHIBIT 12
CHECK REGISTER

Date	Payee	Vo. No.	Ck. No.	L.F.	Vouchers payable	Purchase discount	First National Bank	Peoples State Bank
					Dr.	Cr.	Cr.	Cr.

After vouchers have been entered in the check register and checks issued to creditors, a cross reference, showing the date the vouchers were paid and the check number, is made in the voucher register. Posting from the check register may be done monthly, weekly, or even daily.

The Paid Voucher File.—After vouchers have been passed for payment by the disbursing officer, they are filed in a paid voucher file. The vouchers are usually filed by number. It is convenient to have a cross index so that vouchers may be pulled either by number or creditor's name, since in practice many demands are made on the paid voucher file clerk for information concerning accounting entries and creditors.

It is customary in many concerns to have the canceled checks attached to the vouchers after the returned checks have been audited by the accounting division. The voucher, with its supporting papers, approvals,

and the canceled check, constitute all the necessary informational base and evidence of the liability and payment that any auditor would require.

Special Problems in the Use of the Voucher System.—When the voucher system is in use, special accounting treatment frequently is required for partial payments, purchase returns and allowances, and notes payable. Some difficulties arise when an invoice or obligation is payable in installments, since ordinarily a voucher represents a payment in full and has supporting papers attached to it. If the series of payments to be made are known in advance, a voucher covering each payment can be prepared at the same time, each voucher representing an installment. Supporting papers can be attached to either the first or last voucher of the series, and reference can be made to them on other vouchers. When regular installments are not planned in advance and a partial payment is to be made, it is customary to cancel the original voucher and to issue two or more vouchers in its place. The voucher is marked "canceled." In the voucher register the numbers and dates of the new vouchers are entered in the Paid column. The new vouchers are entered in the voucher register in regular order under the new numbers assigned to them; the amounts are entered in the Vouchers Payable columns as credits; and the total debit is made to Vouchers Payable in the Sundry section. Usually the special problems of handling partial payments are avoided by delaying the preparation of vouchers until it is known what the amount of each payment will be.

When goods are returned to the vendor for credit or special allowances are given after the voucher has been entered in the voucher register but before payment has been made, either the voucher must be canceled and a new one issued or a correction must be made. Corrections can be made in the voucher register in red ink immediately above the entries in the Vouchers Payable credit column and the purchases and cost controlling accounts debit columns. The red figures are deducted when columns are totaled and posted. Canceled vouchers can be treated in the same manner as in the case of corrections except that red ink entries must equal the original entries in amount.

When notes are issued for vouchers which have been entered in the voucher register, the voucher is canceled and a general journal entry is made debiting Vouchers Payable and crediting Notes Payable. When the note is due, a voucher is prepared for the payment and is entered in the voucher register as a debit to Notes Payable in the Sundry section and as a credit to Vouchers Payable.

Questions

1. From what types of business transactions are cost data generally obtained? What books or records of original entry are used in recording transactions involving cost elements?

2. What is a purchase journal? a cash disbursement journal? What debit and credit columns are typical of each journal?

3. How will the purchase journal of a manufacturing concern differ from that of a grocery store? Explain.

4. What is a voucher system? Why is it gaining in popularity as a means of controlling expenditures? What forms of internal check exist when the system is employed?

5. What is a voucher? a voucher check? Describe several forms of vouchers showing the purpose of each.

6. Describe the process of preparing a voucher for payment and recording it in the voucher register.

7. What debit and credit columns are generally used in voucher registers?

8. Describe the process of posting from the voucher register, assuming the use of numerous controlling accounts in the general ledger.

9. What types of subsidiary creditor ledgers may be used when a voucher system is in use? How may unpaid vouchers be filed and indexed? What is a convenient plan of filing paid vouchers?

10. What purposes does the check register or cash disbursement journal serve when incorporated in a voucher system? What debit and credit columns are used in the check register? Describe the posting from the check register.

11. How are each of the following transactions handled when the voucher system is in use:

a. Installment payments of an obligation?

b. Goods returned to the vendor for credit after the voucher has been prepared and entered in the voucher register?

c. A note issued in place of an account payable which has been vouchered?

Problem 1

The Othello Stove Co. manufactures and sells gas cooking stoves. During the month of June the following transactions occurred:

Date	Voucher No.	Check No.	Transaction	Amount	Terms
June 3	601		Purchased materials from Worth & Co.	$1,750	2/10, n/30
4	602		Purchased equipment from Harbin Machine Works	950	n/30
7	603–605		Received advertising services from Central Publishing House	300	$100 on June 7, 14, and 21
		1	Paid voucher 603, June 7 installment	100	
8	606		Purchased factory supplies from McBeth Co.	320	n/30
10	607	2	Paid salesmen's expenses	425	
13		3	Paid voucher 601		
14		4	Paid voucher 604		
15	608	5	Paid first half of June payroll: factory payroll, $5,400; selling salaries, $2,000; administration salaries, $2,035	9,435	
20	609	6	Paid $350 on equipment purchased June 4, and issued 6% note for the balance		
	610	7	Paid yearly insurance premium on machinery and equipment to Central Mutual Insurance Co.	84	
21		8	Paid voucher 605		
24			Returned $20 of factory supplies purchased on June 8		
30	611	9	Paid note issued on June 20 and interest on note		
	612	10	Paid second half of June salaries: factory payroll, $5,450; selling salaries, $2,050; administrative salaries, $2,000	9,500	
	613	11	Paid rent to Rainbow Real Estate Co.: Factory overhead, $2,000; administrative overhead, $1,750; selling overhead, $250		

a. Use the voucher register, check register, and general journal to record all foregoing transactions.

b. Explain the posting to general ledger accounts from each record of original entry.

Problem 2

The Denning Manufacturing Co. uses a voucher register, a check register, and a general journal as records of original entry for all types of transactions. The voucher register contains the following money columns: Vouchers Payable, Materials and Supplies, Payrolls, Factory Overhead, Selling Expenses, Administrative Expenses, Machinery and Equipment, and Sundry. The check register contains columns for Vouchers Payable, Purchase Discount, and Cash. Freight on materials and equipment are added to the invoice cost.

a. Record the following transactions for the month of October in the proper records of original entry.

b. Explain the daily and monthly posting to general ledger accounts and subsidiary records.

Date	Voucher No.	Check No.	Transaction
Oct. 1	1	1	Building rent of $250 is vouchered and paid It is divided as follows: administration, $60; selling, $20; and manufacturing, $170
	2		A new lathe was purchased from the Melton Machine Co., terms, 2/15, n/60, $800
2	3		An invoice, covering purchase of raw materials in the amount of $1,200 from the United Brass Co., terms, 1/15, n/30, is received and vouchered
3	4	2	A $50 freight bill for the new lathe, voucher 2, is vouchered and paid to the Union Pacific R.R. Co.
4	5		A voucher is prepared and entered in favor of the Simplex Co. for $60 for repair parts which are to be kept in the stockroom until needed
7	6	3	A voucher is prepared and a check is issued in favor of the postmaster for the purchase of $15 in stamps
12	7		Purchase of gasoline and oil from the Standine Co., $50
15	8	4	Semimonthly payroll of $2,000 is vouchered and paid
16	9		Advertising bill of $500 for October from White Advertising Co. is vouchered
	10		Insurance premium of $72 in favor of Central Insurance Co. for the year is vouchered
		5	Voucher 2 is paid and discount is taken
17	11	6	Property taxes for the year, amounting to $1,200, are vouchered and paid to the county treasurer
		7	Voucher 3 is paid and the discount is taken
20	12		Purchase of materials, $2,500, from the Baylor Electric Co., terms, 2/10, n/60
22	13	8	A voucher is prepared and a check issued for $100 to Henry Snore, a salesman, for traveling expenses
25	14	9	Freight bill for shipment covered by voucher 12 is vouchered and paid in the amount of $80 to the New York Central R.R.
28		10	Materials, included in the purchase from the Baylor Electric Co., voucher 12, amounting to $100 are returned as unsatisfactory; a check is issued in settlement of the account
29	15–18	11	Machinery is purchased from the National Equipment Co., contract price $4,000, terms $1,000 cash and three monthly installments of $1,000 each. Four vouchers are prepared, and a check is issued for the down payment
31	19	12	Semimonthly payroll of $2,200 is vouchered and paid
	20	13	Power and light bill, $170, is vouchered and paid; distribution: factory overhead, $80; selling expenses, $30; administrative expenses, $60
		14	A check is issued in payment of voucher 5
		15	A check is issued in payment of voucher 9

CHAPTER IV

MATERIAL PURCHASING, ISSUANCE, AND VALUATION

Need for Material Control.—One of the first steps in the installation of a cost accounting system is planning the proper control of materials and supplies from the time orders are placed with suppliers until they have been consumed in plant and office operation or have been sold as merchandise. Materials or merchandise and supplies constitute the most important assets in the majority of business enterprises. The success of business concerns depends to a large extent upon efficient purchasing, storage, accounting control, and consumption.

The human element is an important factor in the purchasing and control of materials. If purchasing is not centralized in a single department or person or is not handled by specialists, there is a tendency for department heads to overstock in regular materials and to expand the scope of their departmental activities and needs. Indulgence in equipment and supplies which may be deemed luxuries and not strict requirements of efficient operation is frequently another result of decentralized purchasing. Inefficient control over purchasing results in loss through failure to take advantage of quantity buying, inopportune buying, additional storage costs, depreciation and obsolescence, and ineffective employment of working capital.

Misappropriation, theft, and waste of materials and supplies are concurrent with a lack of system of control. It appears to be a quirk of human nature to consider that misappropriation and stealing of materials, supplies, and equipment are on a different ethical level than is the theft of cash or of negotiable instruments. An employee who considers himself strictly honest, even one who handles money in the cashier's cage day after day without thinking of absconding with a single dollar, may appropriate for his own use stationery, stamps, and other office supplies. Likewise an employee who is in charge of the gasoline and oil supply room may consider it his privilege to use certain of such supplies to operate his personal automobile. An inadequate system of material control is not fair to employees, and it is costly to the firm.

Even more serious losses are incurred by concerns in which the supply room is available to all employees without a check as to the quantities and purpose for which materials are to be used. The extravagant and wasteful use of material and supplies under such a system results in loss from

spoilage of the excess withdrawn and from the lack of accurate computations of the amount of material or supplies needed for the day's work or for the specific job.

Requirements of a System of Material Control.—The important requirements of every system of material control are as follows:

a. Proper coordination of all departments involved in material purchasing, receiving, testing, approving, storage, accounting, and disbursing of funds.

b. Centralization of purchasing in a purchasing department under the direction and authority of a trained purchasing agent.

c. Use of standard forms upon which only properly written instructions are acceptable.

d. Use of material, supplies, and equipment budgets so that economy in purchasing and use of materials can be realized.

e. Operation of a system of internal check so that all transactions involving materials, supplies, and equipment purchases are checked and approved by a number of properly authorized persons.

f. Storage of all materials and supplies in a designated location, properly safeguarded under supervision.

g. Operation of a system of perpetual inventory so that it is possible to determine at any time the amount and value of each kind of material in stock.

h. Assignment of a minimum quantity to each item of material, below which point the inventory is not allowed to drop, and of a maximum quantity, above which stock is not carried.

i. Operation of a system of stores control and issue so that there will be delivery of materials upon requisition to departments in the right amount at the time they are needed.

j. Development of a system of controlling accounts and subsidiary records which exhibit summary and detailed material costs at each stage of material receipt and consumption from the stockroom to finished goods.

PURCHASING AND RECEIVING MATERIALS

Although details of procedure may vary with individual concerns, the important steps in the purchase and receipt of materials and payment of obligations incurred are as follows:

a. Initiation of purchase requisitions.
b. Preparation and execution of purchase orders.
c. Receipt of materials.
d. Inspection and testing of materials.
e. Adjustment of invoices.
f. Preparation and approval of vouchers.
g. Accounting procedure in the recording and payment of vouchers.

The Purchase Requisition.—A form known as a purchase requisition is commonly used as a formal request to the purchasing department to order goods or services. The purchase requisition serves the dual purpose of authorizing the purchasing department to make a purchase and provides a written record showing quantities, specifications, and date the purchase is required.

The forms are prepared by the stockkeepers for regular stock items which are below or are approaching the minimum quantity requirements. Requisitions are approved by an executive, such as the plant superintendent, who is in charge of stockroom operations. The original copy is sent to the purchasing department, the duplicate is retained by the stockkeeper initiating the purchase requisition, and the triplicate copy may be filed in the office of the authorizing executive. Purchase requisitions also may originate with department heads who require special equipment or materials not stocked as regular items. Requisitions for the purchase of specialized materials for production orders may originate either with the planning department or with the production manager. Approval by one or more executives other than the one originating the requisition is ordinarily required to secure a form of internal check to prevent unnecessary purchases.

The purchase requisition, illustrated by Exhibit 13, contains the requisition number, date, department, quantity, description, specifications, signature of the person initiating the requisition, and signature of one or more executives approving the purchase. An order number is inserted when the purchase order is prepared. The price and vendor may be suggested on the requisition, but the final determination of the cost and supplier remains a problem for the purchasing agent.

The Purchase Order.—When the original copy of the purchase requisition, properly signed by approving officials, is received by the purchasing department, the purchasing agent analyzes each case before making arrangements for the purchase. The need for the particular items requisitioned, the state of the company's financial position, and the trend of the markets and of general business conditions are factors which are considered before the purchase is made. The purchasing department investigates the sources of supply for the purpose of securing the highest quality materials at the lowest price, and due consideration is given to terms and delivery dates.

When the source of supply has been decided, the most common procedure is the preparation of a purchase order. A purchase order is a written authorization executed by the purchasing agent to a vendor to supply a specified quantity and quality of merchandise or equipment at a designated time. The purchase order is a necessary part of every good system of material control. It reduces purchasing and clerical work to a routine, provides vendors with complete specifications, prices, and shipping instructions, aids in checking orders received, furnishes a reference for future orders, and prevents duplication of orders and payments of invoices.

It is a policy of the majority of concerns that a purchase order must be issued for every order for material, supplies, or equipment, regardless

PURCHASE REQUISITION

Purchase req. No._____

Purchase order No._____

Date_____

Please purchase for:

Department No._____ Production order No._____

Ship to:_____ Address_____

F. O. B._____ Via:_____ Date required_____

Item No.	Quantity	Description of articles or services	Grade

Requested by:	Checked by:	Approved by:

Exhibit 13.

PURCHASE ORDER

Purchase order No._____

Date_____ Department No._____

Vendor_____ Production order No._____

Address_____ Date required_____

Please supply the following:

Ship to: F. O. B. Via Terms

Item No.	Quantity	Articles or services	Unit cost	Total cost

Purchasing agent

Exhibit 14.

of whether the purchase is made directly from salesmen, by mail, by telegraph, or by telephone. When purchases are made by personal interview, telegraph, or telephone, the purchase order acts as a confirmation to vendors as well as a record of unfilled orders.

The purchase order (Exhibit 14) is prepared from the specifications included in the requisition for purchase and is signed by the purchasing agent. It contains the name of the vendor, department, in some cases the production order number, date required, a complete description of the goods or services required, terms, prices, and shipping instructions. In purchasing specialized materials and equipment, the description may refer to drawings, blueprints, or pages of specifications; in cases of leases and agreements, contracts are attached as supplementary information. The original copy may be mailed to the vendor, the duplicate copy may be sent to the receiving department, and the triplicate copy may be retained by the purchasing department as a record of the unfilled order. A fourth copy may be prepared and routed to the stockkeeper or department head who initiated the purchase requisition as a notification of the purchase and expected delivery date; a fifth copy may be sent to the material accounting department for entry in the Ordered section of the appropriate stock ledger account.

Receiving Materials.—The receiving department performs the functions of unpacking the goods received and of checking quantities and condition. The question as to the necessity of supplying the receiving clerk with a copy of the purchase order is debatable. Those who oppose doing so argue that checkers tend to be careless when they have before them a list of the items which are to be included in the shipment; consequently, they should be required to prepare a separate materials received report to show goods actually received. The materials received report can then be checked against the purchase order, by either the accounting or the purchasing department. In practice the "blind check" of goods by the receiving department is generally not successful. Employees in the receiving department are not capable of proper classification as to kinds and sizes of materials received. Frequently the materials received report may list descriptions and sizes which do not conform to the purchase order even though the goods are identical.

The plan of preparing a copy of the purchase order with quantities omitted for the receiving department is generally preferred. The copy serves as a notification to the receiving department of the expected shipment so that proper preparations can be made; it authorizes the acceptance of the goods; and it provides an accurate list of items ordered so that a rapid check can be made of goods received.

In case the plan of using materials received reports is used, the vendor, purchase order number, date, quantity, description, grade, and condition

of the materials are noted in the report prepared by the receiving clerk. One copy of the materials received report may be sent to the purchasing department; a second copy may accompany the goods to the stockroom; a third copy may be retained by the receiving department. Exhibit 15 is an example of a materials received report.

MATERIALS RECEIVED REPORT
(To be used for all goods, materials, supplies, and other services)

Received:

Purchase order No._____

At_____
Delivery point

From_____, _____
Vendor Address

Date_____

Quantity received	Description	Grade	Condition of goods

Counted by_____ Approved by_____
Receiving officer

Inspected by_____ Title_____

Exhibit 15.

Inspection and Testing Materials.—Manufacturing concerns may have a testing department. The function of this department is to inspect all goods and equipment received before they are removed from the receiving department to make certain that purchase order specifications

have been met. Samples are subjected to laboratory tests before final approval of goods received is given. Results of the inspection and test are indicated in a special testing report prepared in triplicate; one copy is sent to the purchasing department, a second copy to the office of the plant superintendent or the production manager, and the third is retained in the testing department file. An unfavorable testing report is used by the purchasing department in obtaining adjustments or as authority for the return of goods to the vendor. The testing department is invaluable to department heads and to the purchasing department in preparing specifications to be included in purchase requisitions and in purchase orders.

Adjustment of Invoices.—When the purchase order, the materials received report, or the testing report indicates that the goods or equipment received are not of the type ordered, are not in accordance with specifications, or are damaged, the purchasing department issues a return shipping order indicating that the goods are to be returned to the vendor. The return shipping order is prepared in triplicate; the original is mailed to the vendor, the duplicate is sent to the receiving department, and the triplicate is attached to the invoice.

If the unsatisfactory goods or equipment are retained, an adjustment is requested by the purchasing department from the vendor. The invoice is not vouchered for payment until a credit memorandum is received from the vendor.

Approval of Invoices and Preparation of Vouchers.—When the invoices of goods and services are received by the purchasing department, the process of assembling the business papers connected with each purchase and the preparation of the voucher begin. In some concerns the purchasing department takes the initiative in preparing the voucher and in assembling the necessary supporting papers, while in other concerns the work is done by the accounting department; in either case the process is identical. The invoices received from the vendor form the nucleus upon which the evidence and approval of the obligation are based. The forms assembled in support of the invoice include:

a. Purchase requisition.
b. Purchase order.
c. Receiving report or copy of purchase order approved by receiving department.
d. Testing report.
e. Return shipping order or debit or credit memorandum.

A copy of the purchase requisition and a copy of the purchase order are taken from the purchasing department files and are compared with both the invoice received from the vendor and a copy of the material received report or the receiving department's copy of the purchase order to see that the goods or services received conform in quantities and prices

to those requisitioned and ordered. The business papers may be attached to the invoice, and all the extensions and additions are checked for mathematical accuracy.

The next step is the preparation of the voucher which, when properly approved, is the authority to the accounting department to record the obligation and to the disbursing department to pay the vendor. The voucher may carry a complete description of the goods or services received, or it may refer to the invoice for details. In either case the voucher lists the vendor, the character of the purchases, the amount of the invoice, and the discounts offered. The voucher with the invoice and other supporting papers is sent on a round of executive offices for approvals of the purchase. Frequently signatures obtained for a purchase include those of the purchasing agent, comptroller, and department head or stockroom supervisor initiating the purchase requisition. In cases of large orders or contracts the approval of the voucher by the president or a committee of the board of directors may be required.

Accounting Treatment of Purchases.—The comptroller or an accounting officer usually indicates the account or accounts to be charged when approving the voucher. The voucher, when properly approved, is entered in the voucher register as a debit to such accounts as Materials, Office Equipment, and Factory Equipment, and as a credit to Vouchers Payable.

The voucher, with the invoice and other supporting papers, is filed according to number in an unpaid voucher file to await its submission to the disbursing officer for payment. It is withdrawn from the unpaid voucher file just before the discount date, or when the payment date arrives, and is submitted to the disbursing officer for payment. An entry is made in the check register debiting Vouchers Payable and crediting Cash and Purchase Discount. The paid voucher and supporting papers are placed in a paid voucher file located in the accounting department.

RECORDS FOR MATERIALS

Determining Material Requirements and Initiating Purchase Requisitions.—The stockroom organization should be so planned as to secure specialization in stockrooms and in the duties of stockkeepers. Stockrooms can be located throughout the plant according to material requirement of types of departments. Thus a stockroom may be used exclusively for storing raw materials and located so as to supply the foundry; a stockroom containing semifinished materials may be located in the proximity of the machine shop; finished parts may be stored within easy access of the assembly departments; and office supplies may be in a stockroom in the office building. If one or more large centrally located

stockrooms are used, specialization and arrangement by type of materials are planned within each stockroom in accordance with the requirements of divisions and departments of the company.

Since each stockkeeper serves a certain group of departments, he becomes a specialist in knowing the nature and the quantities of materials required. He learns from experience the changes in seasonal demands, the kinds of material which are standard requirements, and the materials which are desired only for special orders. Stock cards, shelf name plates, and stock ledger cards generally are marked with minimum quantities; whenever the stockkeeper notices through observation of the quantities on hand or of the stock records that the minimum is being approached, he prepares a purchase requisition requesting the purchasing department to replenish the materials in question.

Storing and Safeguarding Materials.—After materials have been unpacked and quantities checked against the purchase order by the receiving department, they are sent to the stockroom storing the particular type of materials received. They are checked in by the stockkeeper who, after their receipt, is held accountable for any shortage or spoilage. The stockkeeper usually acknowledges receipt of materials in a copy of the receiving department's report or in a special notification form.

Materials and parts specially ordered for emergency use for special jobs or machines may not be taken through the stockroom because of the delay the storeroom checking and issuing would cause. But, even though materials are routed directly to production departments, it is desirable to record their receipt and issuance from the invoice or receiving department report in the stock records; the stockkeeper usually inspects and counts them in the department to which they are taken directly.

Materials should be stored in stockrooms protected with walls or wire screen and equipped with doors and delivery windows that are locked when not in use. Every item should be numbered or coded, and should be stored in a definite location noted in a location book or on cards at the end of each aisle, section of shelves, or bin so it may be found instantly. When materials are so bulky that they cannot be stored in stockrooms, they may be piled in sheds or protected yards or stored in containers, but in all cases they should be under the custodianship of a stockkeeper and should be issued only under his supervision. Whenever possible, materials should be packaged in amounts determined by the quantity usually requisitioned in order to save time in issuing. Materials subject to depreciation or obsolescence should be arranged on shelves or in bins in such a way that the oldest items are issued first.

Perpetual Inventories.—A perpetual inventory system consists of maintaining for each type of material an accounting record showing the quantities and value of materials received, issued, and on hand. The

perpetual inventory record may give such additional information as goods ordered, expected delivery date, and unit costs. The advantages of maintaining perpetual inventory records are as follows:

a. The investment in material and supplies may be kept at a minimum.

b. Management may be informed daily of the number of units and the value of each kind of material on hand, information which tends to eliminate delays and shutdowns in plant activities.

c. The cost department has control over costs, because perpetual inventory records and material requisitions provide a record of material costs for individual products, production orders, and departments.

d. It is possible for the financial division to prepare monthly or quarterly profit and loss statements and balance sheets without a physical inventory being taken.

e. A system of internal check is in force at all times, with the activities of the purchasing department, stockroom divisions, and production or merchandising departments being checked against each other.

f. Frequent physical inventories need not be taken.

Records for Materials.—The records generally used in maintaining a system of perpetual inventories and proper control of the issuance of materials consist of stock or bin cards, stock ledger accounts controlled by one or more accounts in the general ledger, material requisitions, and returned material reports.

STOCK CARD

Location_____ Maximum_____

Material_____ Minimum_____

Date	Quantity received	Quantity issued	Balance	Condition

Exhibit 16.

Stockkeepers usually account for materials in their stockrooms on stock cards (Exhibit 16) which may be attached to each bin, shelf, or other form of containers. Stock cards are used as a record of the quanti-

ties of each type of material received, issued, and on hand each day. The cards are not considered as accounting records; they are memorandums for the purpose of informing stockkeepers of the quantities on hand and are used as a check on the stock ledger accounts in the material accounting division.

In large concerns there is usually a divorcement between stockkeeping activities and maintaining accounting records for materials received and issued. The separation of the subsidiary stock ledger from the stockroom is considered desirable, because it inserts another form of internal check into the system of material control. The stock ledger accounts may be in a separate material accounting department or in the cost department, or in small enterprises, where a division of labor is not possible, they may be handled by the stockkeeper in addition to his regular stockkeeping activities. Stock ledger accounts are used as a record of each kind and class of materials carried in stock. The set of stock accounts constitutes the subsidiary stock ledger which is controlled by an account termed Materials or Stores in the general ledger.

The type of stock account used varies with the concern. A common form is the perpetual inventory card, which can be altered or replaced in the card file when changes occur in the type of material carried in stock. Bookkeeping and tabulating machines can be used to good advantage in posting receipts and issues and in computing balances in subsidiary material records. Exhibit 17 is illustrative of a stock ledger account. Entries are made in the Ordered section when a copy of the purchase order is received by the material accounting department from the purchasing department. When materials are received and checked by the stockkeeper, entries are made in the Received section directly from the invoice or receiving department report. Entries for quantities are recorded in the Issued section from material requisitions received from stockkeepers for materials issued to service and production or merchandising departments.

The stock ledger sheets of many concerns contain a Reserved or an Appropriated section which is inserted between the Received and Issued sections to show the quantity of the material reserved for special orders. The section is generally used as a memorandum and contains columns for date, production order, and quantity. The Reserved section serves the purpose of indicating the materials to be required for production in process or to be put in process in the near future. The quantity of materials reserved does not affect the Balance section of a stock ledger account until the materials received are actually issued.

It is a rigid policy of every good system of material control that no materials can be issued from stockrooms except on properly prepared and approved material requisitions. The material requisition is a written

STOCK LEDGER SHEET

Article _____ Code No. _____

Size or type _____ Section _____ Bin No. _____

Unit _____ Maximum _____ Minimum _____

	Ordered				Received					Issued						Balance		
	Date	Purchase order No.	Quantity	Date expected	Date	Purchase order No.	Quantity	Unit cost	Total cost	Date	Requisition No.	Department or production order No.	Quantity	Unit cost	Total cost	Quantity on hand	Unit cost	Total cost

Exhibit 17.

order to the stockkeeper to deliver designated materials to a certain department at a specified time. Each stockkeeper is supplied with the names and signatures of department heads and foremen who are authorized to requisition materials. The material requisition, illustrated as Exhibit 18, includes date, requisition number, department charged, name or symbol of stock ledger account to be credited, description of materials, quantity, unit price, total value, delivery point, signature of person

MATERIAL REQUISITION

Requisition No._____

Date_____

Deliver to_____ Charge_____

_____Department _____

Quantity	Code number	Description	Unit cost	Amount

Requisitioned by_____ Approved by_____

Exhibit 18.

requisitioning the material, and signature of the department executive approving the request for material. The production order number is also included in requisitions of manufacturing concerns which use a job order cost system.

ISSUANCE OF MATERIALS

Procedure of Issuing and Accounting for Issued Materials.—A common procedure used in issuing materials is described as follows. Material requisitions are authorized and prepared by the planning department in

some concerns and by department executives or foremen in other concerns. The material requisition is prepared in duplicate and shows description and quantities of materials required by a department or process. Both copies of the requisition are sent to the stockkeeper who issues the material and records the quantities disbursed in the Quantity Issued section of the appropriate stock or bin cards. Then both copies of the material requisition are sent to the material accounting division for pricing and entry in the stock ledger. The pricing clerk enters the unit price and the total cost of material on both copies of the requisition.[1] One copy of the requisition is retained by the stock ledger clerk; the other copy is sent to the cost clerk, department head, or foreman who uses it as the basis for a charge to the appropriate production order or department for which the material was issued.

The stock ledger clerk's copy of the requisition is used as the basis for an entry in the Issued section of stock ledger accounts showing the date, requisition number, department symbol or production order number, quantity, unit cost, and value. The Balance section of the stock ledger accounts is then completed to show the new balance figures for quantity, unit cost, and valuation. A recapitulation of the requisitions which are sorted by departments, by processes, or by direct and indirect materials, depending upon the type of concern, is the basis for the preparation of the journal entry to be posted to the general ledger. The controlling account, Materials, is credited for the total amount; the debit is made to processes or operations in manufacturing concerns using the process system and to Materials in Process for direct materials and to Factory Overhead Expense for indirect materials in manufacturing concerns using job order cost accounting. A detailed explanation of accounts to be charged for materials consumed is given in later chapters.

Special Types of Material Requisitions.—Departments having standard material requirements or a comparatively fixed list of materials or supplies generally use a special form of material requisition. One form termed a "bill of materials" is similar to a laundry slip in form and lists the names or symbols of all materials regularly requisitioned. In preparing such a requisition, it is necessary only to indicate the quantity in the blank space in front of the name or symbol of the material required. The items of materials not usually required can be written in the blank space at the bottom of the requisition, or a blank requisition form can be prepared.

A second plan can be used successfully in concerns manufacturing a standard product or having uniform processes such as assemblies. Departments can supply stockkeepers with a list of parts or materials needed to complete a certain job or assembly designated by a name or

[1] See pages 65–71 for an explanation of methods of pricing requisitions.

symbol. Instead of listing all the materials required, a department head or foreman can specify in a requisition the number of jobs or assemblies of a certain type scheduled for production, and the stockkeeper can fill the order from his list of parts or materials needed.

Requisitioning Small and Indeterminable Quantities.—Small items of material, such as nails, screws, bolts, ink, glue, and chemicals, are requisitioned by weight or measure. Since departments frequently cannot determine in advance the quantity needed, a requisition is prepared, but the quantity and cost are omitted temporarily. The stockkeeper issues a quantity and holds the requisition until the material is reported to be consumed or until a portion of it is returned. The requisition is then sent to the pricing clerk in the material accounting department to be costed and entered in appropriate stock ledger accounts; the duplicate is given to the department consuming the materials.

Materials Returned to Vendors.—When materials are returned to the vendor after having been received in stockrooms and entered in stock ledger accounts, two different correcting entries can be made. From the return shipping order issued by the purchasing department, information regarding the quantity and value may be entered in the Received section of the stock ledger accounts in red ink, or an entry can be made in the Issued section with a special notation or symbol to indicate that the goods were returned to the vendor and not issued to departments or processes. The first entry is generally preferred, because it emphasizes the nature of the transaction and makes easier the preparation of material summaries.

In the general ledger accounts the Materials controlling account is credited, and Vouchers Payable is debited for the total value of materials returned; corresponding corrections are made in the unpaid vouchers or vendors' accounts.

Materials Returned to the Stockroom.—Material requisitioned from a stockroom and not needed or found to be defective is returned to the stockroom, where a returned material report is prepared either by the person returning the material or by the stockkeeper upon receipt of the material. Two copies of the report are usually required; the original is used as a basis for entries correcting the stock ledger accounts, while the duplicate is retained in the files of the department returning the material to stock.

Since the material returned to the stockroom is a reduction in the amount recorded as issued, the preferable entry is to enter the number of units and the value of material received in red ink in the Issued section of the stock ledger accounts. When a summary of material issued is prepared, the amount and value of goods returned to the stockroom are deducted from the total issued, and the amount returned by each depart-

ment, as shown by the returned material slips, is deducted from the total amount charged to each department. Another method of entering materials returned to the stockroom in the stock ledger accounts is to put the number of units and the value in the Received section, with a special notation or symbol to prevent the entry being considered a receipt of new materials.

If entries have already been recorded in general ledger controlling accounts before materials are returned, a correcting journal entry can be made debiting the Materials controlling account and crediting the departments, processes, or work in process accounts originally charged.

VALUATION OF MATERIALS

Determination of Cost of Incoming Materials.—The proper valuation of materials received and placed in stock is an important cost accounting problem. The question arises as to what elements of cost should be included in the valuation of materials. The invoice price of materials at the vendor's shipping point, less all trade discounts offered, plus transportation costs to the receiving department of the concern making the purchase may be called the visible cost items which are usually recognized in the accounting records. From the point of view of sound accounting theory, cash discounts taken may be deducted from the invoice cost of materials, or, depending upon the policy of the individual concern, they may be treated as an income element. But what disposition should be made of other material costs which are less tangible in character, such as cartage, receiving, unpacking, inspection, testing, insurance, storage, material accounting, and purchasing costs? These costs are just as legitimately a part of the cost of putting materials in a usable state as are the invoice and transportation costs.

All costs of whatever nature incurred up to the point of placing materials and supplies in a condition suitable for issuance from the stockroom should compose the cost value of materials. For practical purposes, in order to avoid the difficulties of determining the amount of receiving, handling, purchasing, and storing costs applicable to each shipment of materials received, many concerns limit the computation of material costs to invoice costs, less trade discounts, plus transportation charges. All other material costs are considered overhead costs of the period in which the purchase was made and the goods received. Such a treatment affords an easy way of handling a difficult cost problem, but it does not present an accurate cost analysis or a correct valuation of materials. Few concerns purchase materials in the same quantities during each month of the year. Production and sales are seasonal, which requires that purchases be made months in advance of production. Thus the automobile industry has its peak production beginning in August and

extending to April, on a decreasing basis after February. Sales of new cars increase late in the fall and reach a peak beginning in January. In such industries the purchasing and handling of materials must come in advance of production; many types of raw materials and finished parts are contracted for many months in advance of actual consumption. If purchasing, receiving, and other forms of handling costs are treated as overhead costs, it means that they are charged to production or to profit and loss in the month incurred. Thus a particular month or a 3-month period may be charged for purchasing and handling materials which are not to be requisitioned out of stockrooms for production or sale as finished products until subsequent periods. During periods when heavy purchases are being made, expenses charged to profit and loss are overstated, and the value of materials in stockrooms is understated, with a resulting understatement of profits for the period. During periods of heavy production and sales, the cost of goods manufactured and sold is understated, costs of purchasing, receiving, and handling goods are understated, and profits are overstated. However, it is evident that, if business concerns are not subject to seasonal fluctuations in purchases, production, and sales, an understatement of material inventory values is the only result.

A practical application of the inclusion of all elements of cost in inventory values is found in the adjustment of fire losses by insurance companies. It is recognized by the courts and insurance companies alike that the value of inventories destroyed by fire consists of all costs of purchasing, receiving, and handling the merchandise or materials up to the point where it is in a salable state. The total cost value is adjusted for depreciation in the value of the goods due to changes in market prices, in styles, and in physical condition.

Applied Purchasing and Handling Costs.—If it is assumed that the cost of material should include the price paid to the vendor after deducting both trade and cash discounts and adding freight charges, cartage, receiving, testing, insurance, and storage costs, an applied rate can be used to add an estimated amount of handling costs to invoices of materials received.

One group of purchases includes merchandise or semiprocessed parts which are either salable, further processed, or used in assemblies in the finishing departments. These parts are purchased according to standard specifications, are contracted for some time in advance, and usually are not susceptible to current market-price changes. The production and sales budgets exhibit the expected production and sales, broken down by units and by classes of products for the budget period, which give the purchasing department adequate information as to the quantity of each class of material needed for the budget period. The actual

contract price per unit, plus an estimated amount of freight, receiving, handling, storage, and purchasing cost, should constitute the cost of material for the period. To obtain the estimated amount of these various charges for the period, the management should resort to overhead budgets for estimates of freight-in, cartage, receiving, uncrating, counting, testing, storage, insurance on the goods, and perhaps of purchasing department costs. The total amount of the estimates should be divided by the total number of units to be purchased or by the total contract price, less trade and cash discounts, to obtain the estimated amount of handling charge to be applied to each unit or dollar of purchase. In many cases the purchase requirements of this class of materials will be so varied that the number of units will be an impractical basis for the application of the receiving and handling charges, and it will be necessary to resort to the value of the purchases in terms of dollars.

A hypothetical case will make the above-mentioned method more easily understood. It may be assumed that the X Manufacturing Co. uses 50 different classes of parts which are purchased in completed form, ready for assembly. Definite price contracts are entered into for the 6-month budget period for this class of material at a total net cost of $24,000, trade and cash discounts having been deducted. The expense budgets show estimates for these purchases for the period as follows: freight-in, $400; cartage, $50; receiving department costs, $200; storage, $50; insurance, $25; and purchasing department costs, $475. Using the contract cost of the material as a basis, the formula is as follows:

$$\frac{\text{Estimated receiving and handling charges for budget period}}{\text{Cost of materials for the period (contract price)}} = \frac{\$1,200}{\$24,000} = 5\%, \text{ the amount to be applied to each dollar of purchases.}$$

Therefore, if casting 2056 had a contract price of $1 per unit, $0.05 would be added for receiving, handling, and purchasing cost. The cost price for the part for the period would be $1.05.

If materials are not contracted for in advance, the quantity requirements can be obtained from the purchasing budget, and existing price lists can be resorted to for price estimates for the budget period. The same procedure of applying receiving, handling, and purchasing costs to material can be followed, except that the denominator in the formula would be "estimated cost of materials for the period" instead of the actual contract cost.

The daily accounting entries in the subsidiary material records consist of a charge in the Received section of the stock ledger sheets in the stock ledger for the estimated amount of handling costs applied to the net invoice cost of materials purchased, either as a separate item or included in the cost of material, and a credit entry on a summary

sheet for applied handling costs. Monthly, or more frequently, the applied handling cost summary sheet is used as the basis for the general journal entry debiting the Materials controlling account for the total applied handling costs charged to individual stock ledger sheets and crediting Applied Material Handling Costs. At the end of each month, the actual expense accounts for handling materials, such as Freight-in, Cartage-in, Receiving Department Expense, Testing Department Expense, Insurance on Materials, Storage Expenses, and perhaps Purchasing Department Expense and Material Accounting Department Expense, are credited; the Applied Material Handling Costs account is debited. If the Applied Material Handling Costs account has a debit balance at the end of the period, it signifies that the actual costs have been greater than the amount applied, the result being unabsorbed handling costs. If the account has a credit balance, more handling costs have been charged than actually were incurred. The balance in either case should be treated as a deferred item to be absorbed through the adjustment of the applied rate in subsequent periods or should be closed to the Profit and Loss account and shown as an operating expense or as a deduction from operating expenses.

Determining Costs of Materials Issued.—Another important problem of costing materials is the proper pricing of units issued from stockrooms. Material requisitions are filled in by the pricing clerk in the material accounting division with a unit cost and a total cost value, but the determination of proper prices is a complex problem unless all goods are bought under long-term contracts at a fixed price. Market prices are subject to constant change, and each invoice received covering materials may have a higher or lower price per unit than the preceding one. Invoices are adjusted for discounts, transportation charges, and perhaps for other handling costs, and the revised cost is entered in the Received section of stock ledger accounts. A method which will be used consistently must be adopted in pricing requisitions. The alternative methods of pricing issued materials are as follows:

a. First-in, first-out method of valuation.
b. Average method.
c. Last-in, first-out method.
d. Standard price method.

The Treasury regulations permit the practice of pricing raw materials into process for tax purposes by the first-in, first-out method, the average method, and the last-in, first-out method of valuation.

The diversity of methods of costing materials issued from stock is evidenced by a survey of 826 companies by the National Industrial Conference Board. The report[1] shows the following information:

[1] "Prevailing Practices in Inventory Valuation," p. 6, National Industrial Conference Board, Inc., New York.

Do you charge raw materials into process at:	Companies Replying	
	Number	Per Cent
A. Average cost?	355	39
B. First-in, first-out cost?	143	15
C. Actual cost of specific lots?	219	24
D. Standard cost?	147	16
E. Last-in, first-out cost?	25	3
F. Some other basis?	27	3
	916	100

The bulletin states that replies exceeded the total number of companies which answered the questionnaire because more than one method is used by some concerns that process more than one type of product.

First-in, First-out Method.—The first-in, first-out method of material pricing, frequently termed the "recent purchase" method, is used most successfully for stockrooms handling items of some bulk with a relatively high unit cost, since it is easy to identify units belonging to a particular lot.

When the first-in, first-out method is used, it is assumed that materials are issued from the oldest supply in stock and that units issued are priced at the oldest cost price listed on the stock ledger sheets, the materials on hand at all times being the most recent purchases. When a requisition for a certain type of material is presented to the stockkeeper or stock ledger clerk, he uses the cost price of the first lot of material received which is still on hand. If the quantity desired is greater in amount than the units remaining in the first lot, he uses the cost price of the second lot, then of the third and fourth until enough material is obtained to fill the requisition. The actual physical handling of materials in bins and on shelves in accordance with the first-in, first-out method is imaginary in most concerns, but it is the method of handling which should be followed in case of materials which are subject to deterioration and obsolescence. Regardless of the manner of physical arrangement that is followed, the stock ledger sheet and material requisition pricing according to the first-in, first-out method can be used.

The excerpt from a stock ledger sheet, shown on page 67, illustrates this method.

In this illustration, requisition 106 for 50 units is priced at $0.25 since the July 2 order is the only one in stock. Requisition 805, received on July 30, requests 75 units. In filling the order 50 units remaining from the July 2 lot are priced at $0.25, and 25 units from the July 25 lot are priced at $0.30. In filling requisition 2310, dated Oct. 5, it is necessary to use three prices. To obtain the required quantity of 335 units, 25 units remaining from the lot received Aug. 10 are priced at $0.35; 300 units depleting the lot dated Sept. 3 are priced at $0.30; and

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Date	Purchase order No.	Quantity	Unit cost	Total cost
July 2	1001	100	$0.25	$25.00
25	1210	200	0.30	60.00
Aug. 10	1980	50	0.35	17.50
Sept. 3	2200	300	0.30	90.00
30	2657	25	0.40	10.00

ISSUED

Date	Requisition No.	Dept. or production order No.	Quantity	Unit cost	Total cost
July 10	106	10	50	$0.25	$ 12.50
30	805	2	50 25	0.25 0.30	20.00
Aug. 1	1025	2	100	0.30	30.00
15	1099	10	75 25	0.30 0.35	31.25
Oct. 5	2310	3	25 300 10	0.35 0.30 0.40	102.75

the remaining 10 units, necessary to complete the order, are taken from the lot dated Sept. 30 and priced at $0.40. The procedure becomes complicated if three or more lots are in stock at any one time, but in practice there are seldom more than two differently priced lots on hand.

When materials are returned from requisitioning departments to the stockroom for credit, the problem arises as to the proper method of handling such returns in stock ledger sheets. One plan is to consider the material returned at the price it was issued originally, to keep it in suspense by a special marking or symbol, and to issue it at the old price on the next requisition which is received. A second plan is to treat the returned units as if they were a new purchase, to retain the original pricing, but to give the material a position after the last purchase received.

The advantages of the first-in, first-out method may be summarized as follows:

a. It is strictly a cost method.

b. Pricings are taken directly from stock records and represent actual costs.

c. It is based upon the assumption that materials are handled in accordance with the first-in, first-out method of routing.

d. Abnormally high or low invoice prices do not affect successive material pricings as occurs when average price methods are used.

e. It is approved and recommended by the Bureau of Internal Revenue.

f. It is preferred by many accountants.

There are no serious objections to this method other than the amount of detailed work which is necessary in connection with pricing such small items as nuts, bolts, and finished parts which are issued in small quantities.

Average Method.—An average method, also known as the "moving average" method, is used if management is interested in average costs rather than in actual costs of material. Frequently it can be used to good advantage when market prices are subject to constant changes or when the materials consist largely of small items issued in small quantities. The general plan of pricing is to obtain a new average unit cost and total cost of material each time a new purchase is received. The cost of material on hand is divided by the number of units to obtain an average cost per unit. The computed average cost is used in pricing invoices until a new shipment of material is received at a different cost. Then it is necessary to add the cost value of material received to the value of material on hand, to add the units received to the units on hand, and to divide the new value of material by the total units to obtain a new average cost per unit.

The method is illustrated on page 69 by the use of the same figures as were given to explain the use of the first-in, first-out method.

The unit price of $0.25, the cost of material purchased on July 2, is used to price requisition 106 dated July 10. When 200 units were received July 25 at a cost of $0.30, a new average unit cost of $0.29 was computed. This pricing was used for requisition 805 dated July 30 and for requisition 1025 dated Aug. 1. August 10 a shipment of 50 units was received costing $0.35 a unit; a new average cost of $0.314 was computed and was used to price requisition 1099 dated Aug. 15. A lot of 300 units was received Sept. 3 at a cost of $0.30 a unit, and a new average cost per unit of $0.3011 was obtained, but no material was issued at this pricing. A small shipment of 25 units at a cost of $0.40 a unit was received on Sept. 30; a new average cost per unit of $0.3082 was computed and was used to price requisition 2310 dated Oct. 5.

When unused materials are returned to the stockroom, they are entered in the Received section of stock ledger sheets at the price originally issued. They should be treated as a new purchase and a new average cost per unit should be computed. If the quantity is negligible, they can be held in suspense and issued as a part of material supplied on the next requisition received.

A number of advantages may be attributed to the average method. It is a cost method and supplies an average cost, which is of greater interest to some officials in costing production than is an actual cost. In periods of rapidly increasing or decreasing material costs, an average cost tends to narrow the extreme prices; the trend upward or downward is

RECEIVED

Date	Purchase order No.	Quantity	Unit cost	Total cost
July 2	1001	100	$0.25	$25.00
25	1210	200	0.30	60.00
Aug. 10	1980	50	0.35	17.50
Sept. 3	2200	300	0.30	90.00
30	2657	25	0.40	10.00

ISSUED

Date	Requisition No.	Dept. or production order No.	Quantity	Unit cost	Total cost
July 10	106	10	50	$0.25	$ 12.50
30	805	2	75	0.29	21.75
Aug. 1	1025	2	100	0.29	29.00
15	1099	10	100	0.314	31.40
Oct. 5	2310	3	335	0.3082	103.24

BALANCE

Date	Quantity on hand	Unit cost	Total cost
July 2	100	$0.25	$ 25.00
10	50	0.25	12.50
25	250	0.29	72.50
30	175	0.29	50.75
Aug. 1	75	0.29	21.75
10	125	0.314	39.25
15	25	0.314	7.85
Sept. 3	325	0.3011	97.85
30	350	0.3082	107.85
Oct. 5	15	0.3082	4.61

more gradual, as contrasted with a stairstep type of increase or decline when prices are taken from the actual invoices under the first-in, first-out method.

Last-in, First-out Method.—The last-in, first-out method, which is frequently known as the "replacement cost" method receives its support from the theory that goods sold are those most recently purchased, that goods are issued from stock in accordance with the last-in, first-out plan. The cost of the last lot of materials received is used to price requisitions until that consignment is exhausted; then the next lot pricing is used, and so on through successive lots. Materials are issued at costs approxi-

mating current market prices, but inventories tend to be costed at the values of the oldest lots on hand, giving a pricing which may be out-of-date with current invoice prices.

The use of the last-in, first-out method is recommended to its members by the following trade associations: American Petroleum Institute, Lead Industries Association, Non-Ferrous Ingot Metal Institute, Copper and Brass Mill Products Association, and Tanners Council of America. The method is recommended by the Committee of Controllers Institute of America as a sound method of costing sales and of determining inventories in certain specialized industries. The committee contends that the first-in, first-out method is inapplicable to certain industries and expresses its opinion as follows in recommending the last-in, first-out method:[1]

> The first-in, first-out method clearly distorts the income for the year and fails to produce the correct cost of goods sold in those industries where the following conditions are present:
>
> (a) The inventory turn-over consumes a relatively long period of time either because of the length of processing, or conditions of merchandising, thus necessitating the maintenance at all times of a substantial inventory;
> (b) The average investment in inventory is relatively large as compared with other assets;
> (c) The inventory consists of a few basic and imperishable commodities which are subject to wide price fluctuations; and
> (d) The cost of raw materials constitutes a substantial part of the cost of the finished product, and increases in the prices of raw materials are promptly reflected in the price of the product.

The last-in, first-out method produces balance sheet figures that are out of date when compared with present costs but results in the least fluctuation in net income, since the cost of sales figures are the largest when prices are rising and the smallest when prices are falling.

Standard Price Method.—In manufacturing concerns using a system of standard costs, it has been found advantageous to have standard prices for materials in effect for a definite period of time, perhaps for a year. An investigation of contracts for the purchase of materials, price lists, and market conditions is made in advance of the accounting period, and a standard price is established for each class of material. Stockkeepers are supplied with a list of standard material prices which is used to enter all materials received and to price material requisitioned from stockrooms. Thus both stockkeepers and departmental executives become familiar with established prices for materials, a familiarity which

[1] "Last-in, First-out Inventorying Takes Care of Wide Fluctuations," *The Controller*, May, 1939, pp. 161–162.

results in fewer complications and in lessened clerical work accompanying the receipt of materials at varying invoice prices.

When purchase invoices are vouchered, the Materials controlling account is charged for the established standard cost, Vouchers Payable is credited for the invoice cost, and any difference between the actual and standard cost is debited or credited to a buffer or intermediate account such as Material Price Variance. A detailed discussion of standard material costs and of the accounting treatment is given in Chap. XVII dealing with standard costs.

Physical Inventory of Materials.—Even if perpetual inventory records are maintained, it is advisable to take a physical inventory of material and supplies at least once a year. An actual count and appraisal are necessary in order to check the accuracy of the perpetual inventory records and to segregate materials which are obsolete or in a deteriorated condition. Two general methods for taking physical inventories are in use. One consists of a continuous physical inventory, and the other of the periodic physical inventory which consists of an actual count made at the close of each fiscal period or at regular intervals of the year.

The continuous physical inventory method is adaptable in large concerns which can afford to maintain a trained staff to take inventory throughout the year. The plan has the advantage of not requiring a shutdown of business operations or the employment of untrained employees in inventory operations. It has the added advantage of encouraging stockkeepers and clerks to have their stock of materials and records in order and up-to-date at all times in anticipation of the unexpected arrival of the inventory staff. The frequency of the inventory taking in a given stockroom or department depends upon the type of materials and the record of efficiency of a given division. Departments or stockrooms storing materials subject to waste or obsolescence may be inventoried as frequently as once or twice a month, while other divisions may be checked only two or three times a year. When such a system is in force, adjustments to inventory records for errors, shortages, or changes in values are made at the completion of the inventory in each division. When perpetual inventory records are checked by an efficient system of continuous inventory taking, the perpetual inventory records generally are considered true balance sheet cost values by public accountants, banks, and credit agencies.

Questions

1. Why is the proper control of materials and supplies such an important part of systems of cost accounting?

2. Enumerate the important requirements of every system of material control.

3. What functions of material control are the responsibility of each of the following departments or divisions: the budget committee, the purchasing department, the

receiving department, the testing department, stockrooms, production departments, the financial division, and the administrative division?

4. Describe in detail the activities of the purchasing department of a manufacturing establishment.

5. What forms of statistical and accounting records are maintained in the purchasing department?

6. What is the purpose of the purchase requisition? What type of information does it contain? What disposal is made of each copy?

7. What purposes does the purchase order serve? Why is it an important part of the system of material control? What information does it contain?

8. Explain alternative methods of checking and recording materials and supplies by the receiving department. Describe the materials received report. How does it differ from the testing report?

9. Describe the procedure of checking invoices and the preparation of vouchers for purchases of materials and supplies. What business papers are customarily attached to vouchers?

10. In cases of errors in invoices, incorrect quantities of materials received, inferior materials, or damaged shipments, what adjustments are made by the purchasing department?

11. In what books of original entry are purchases of materials and supplies recorded? What debits and credits are made in a purchase book? in a voucher register?

12. What entry is made in the check register when a voucher for material purchases is paid? What disposition is made of the paid voucher?

13. What plan of organization and arrangement of materials and supplies would you recommend for stockroom control for a manufacturer of office furniture and equipment?

14. What are the important functions performed by stockroom divisions? Discuss each briefly.

15. Explain what is meant by a perpetual inventory system of controlling materials and supplies. What are the advantages attributed to such a system?

16. Describe the accounting records required in the maintenance of a system of perpetual inventories.

17. What are material requisitions? Why are they an important part of a system of material control? What forms of requisitions are used in manufacturing concerns for handling large quantities of materials required by production departments? How are small items such as bolts, screws, ink, and various types of chemicals requisitioned?

18. What general ledger accounting entries are necessary to record the purchase of materials and supplies? To record the issue of materials and supplies from stockrooms?

19. What general ledger and subsidiary record entries are required for each of the following business transactions (assume that the journals of original entry consist of a voucher register, a check register, and a general journal):

a. Purchase of raw materials at a total cost of $1,000 is vouchered, and a check is issued; the materials are received and checked into the stockroom?

b. Materials costing $100 are returned from the stockroom to the supplier for credit?

c. A requisition for materials costing $200 is filled by the stockkeeper for production department A?

d. Material valued at $20 is returned by production department A to the stockroom for credit?

20. Why is the determination of the cost of incoming materials a difficult and an important accounting problem? What elements of cost should be included in the valuation of materials received?

21. Explain the accounting treatment for the application of material purchasing and handling rates to the cost of goods received. How are the actual purchasing and handling costs recorded? What disposition should be made of the variance between actual and applied purchasing and handling costs?

22. Why is there an important problem involved in determining the proper pricing of materials and supplies issued from stockrooms on requisition? What are the alternative methods of pricing issued materials?

23. Explain the principles underlying the first-in, first-out method of pricing materials. What are the advantages and disadvantages attributed to the method? Is it commonly used and generally accepted?

24. What is the average method of pricing materials issued? Explain how it is used and its advantages and disadvantages.

25. Explain the principles upon which the last-in, first-out method of pricing issued materials is based. Under what circumstances is its use recommended by the Committee of Controllers Institute of America?

26. What is the standard price method of pricing materials issued? Is it a commonly used method? Why is it gaining in popularity?

27. During rapid increases in market prices of materials used in production, which method of pricing results in the most accurate costing of goods manufactured and sold? during periods of rapidly decreasing market prices? How would your answer differ if there is not a corresponding change in the selling price of the finished products sold?

28. Why is a periodic physical inventory of materials and supplies necessary when there is a system of perpetual inventory records in use?

Problem 1

The Mako Manufacturing Co. plans to value its raw materials received in the stockroom and issued to production departments at cost, which is to include invoice cost; less cash and trade discounts; plus freight-in, cartage-in, receiving cost, testing cost, insurance, storage and stockroom cost, and purchasing expenses. The receiving and handling costs are to be applied to the invoice cost of each shipment of materials received and to be included in the cost of the materials charged to the Materials controlling account in the general ledger and to the individual stock ledger sheets. A single applied material receiving and handling rate is to be used, and the basis of distribution is to be cost of materials purchased for the 3-month budget period.

The budget of material receiving and handling costs for the 3-month accounting period, January, February, and March, lists the following estimated costs:

Freight-in	$ 230
Cartage-in	90
Receiving department costs	180
Testing department costs	150
Insurance	50
Storage and stockroom costs	300
Purchasing department costs	1,000
Total estimated costs	$2,000

The purchasing budget shows estimated net purchases for the period of $25,000.

The following shipments of materials were received during the period:

Jan. 10 Purchase order 1, $5,000 of material A from Manning Manufacturing Co., terms, 2/10, n/30.
25 Purchase order 2, $2,000 of material B from Melrose Steel Co., terms, 10% trade discount, 2/15, n/60.
Feb. 8 Purchase order 3, $500 of material C from Rulo Products Co., terms, n/60.
20 Purchase order 4, $8,000 of material D from Thompson Steel and Iron Co., terms, 5% trade discount, 1/10, n/30.
Mar. 12 Purchase order 5, $9,000 of material A from Manning Manufacturing Co., terms, 2/10, n/30.

The company takes all discounts and records materials at invoice price less trade and cash discounts.

The actual receiving and handling costs during the accounting period were as follows: freight-in, $225; cartage-in, $90; receiving department costs, $185; testing department costs, $160; insurance expired, $50; storage and stockroom costs, $290; and purchasing department costs, $1,025.

a. Compute an applied material receiving and handling rate for the Mako Co., showing your formula and computations.

b. Set up general ledger and subsidiary stock ledger accounts; record the purchases of materials in journal form and apply receiving and handling costs to each purchase; post entries from the journal to ledger accounts.

c. Prepare journal entries and ledger accounts to record the actual receiving and handling costs.

d. Compute the variance between actual and applied receiving and handling costs, and explain how the variance should be disposed of.

Problem 2

The Harmon Products Co. values its purchases of materials at invoice cost, less cash discount, to which are applied receiving and handling costs.

The purchasing agent and accountant collaborate in preparing the following estimates of receiving and handling costs and other information regarding purchasing and storage for the month of September:

Freight-in	$ 1,250
Cartage-in	175
Receiving department costs	375
Purchasing department costs	400
Storage	170
Insurance	30
Testing department costs	100
Total estimated costs	$ 2,500

Stockroom to be occupied by purchases	25 × 25 × 10 ft.
Number of tests to be made	200
Weight of purchases	5,000 lb.
Number of purchases	100
Number of units to be purchased	2,500

Gross purchases	$25,500
Cash discount	500

1. Compute rates to apply receiving and handling charges on net purchases cost basis and on number of units purchased basis.
2. Apply both rates to a purchase of 100 units @ $50 per unit less a cash discount of 2% which will be taken.

Problem 3

The following excerpt from a stock ledger sheet of a manufacturing concern shows transactions for material received and issued for the month of May:

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Date	Purchase order No.	Quantity	Unit cost	Total cost
May 1	1	50	$0.15	$ 7.50
5	10	150	0.16	24.00
9	25	300	0.14	42.00
15	84	200	0.15	30.00
20	95	10	0.20	2.00
25	105	75	0.19	14.25
30	150	100	0.18	18.00

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Date	Requisition No.	Department or production order No.	Quantity
May 2	201	D-11	25
8	220	P-100	125
16	334	P-214	510
18	360	D-12	5
22	372	D-3	20
30	398	P-126	150

Prepare stock ledger sheets containing received, issued, and balance sections in which are included both unit costs and total costs computed:

a. By the first-in, first-out method of costing.
b. By the average-cost method.
c. By the last-in, first-out method.
d. Show the inventory value of the material on hand on May 31 by each method.

Problem 4

Enter the following transactions in the stock ledger account for material X. Use the first-in, first-out method of pricing requisitions and determine the inventory as of Jan. 31.

Date	Transaction	Quantity, units	Amount
Jan. 2	Beginning balance	100	$20
4	Purchase order 109	100	25
7	Purchase order 112	50	15
9	Requisition 8	25	
10	Requisition 22	100	
15	Purchase order 319	75	15
23	Requisition 98	75	
24	Units returned to stockroom charged to requisition 8	10	
26	Requisition 104	20	
27	Units included in purchase order 319 returned to vendor	10	
28	Purchase order 330	100	25
29	Requisition 108	25	
30	Requisition 120	75	

Problem 5

a. Use the information given in Prob. 4 to prepare the stock ledger account for material X; price requisitions and determine the inventory on January 31 by the average-cost method.

b. Use the information given in Prob. 4 to prepare the stock ledger account for material X; price requisitions and determine the inventory on Jan. 31 by the last-in, first-out method.

Problem 6

Set up a stock ledger sheet for material Y with the following columns:

Ordered:
- Date
- Purchase order No.
- Quantity
- Date expected

Received:
- Date
- Purchase order No.
- Quantity
- Unit cost
- Total cost

Issued:
- Date
- Requisition No.
- Department or production order No.
- Quantity
- Unit cost
- Total cost

Balance:
- Quantity
- Unit cost
- Total cost

Record the following transactions, pricing the material issued by the first-in, first-out method. Show the balance after each transaction and the inventory value on July 31.

July 1 Balance, 100 units @ 10¢ per unit, $10.
1 Ordered 400 units, purchase order 5; expected July 6.
2 Issued 25 units, requisition 100, Dept. A.

4 Ordered, 200 units, purchase order 10; expected July 8.
6 Received, 400 units, purchase order 5, @ 11¢ per unit.
7 Issued, 150 units, requisition 102, production order 201.
8 Returned to stockroom 10 units from Dept. A, requisition 100.
10 Received, 150 units, purchase order 10 @ 12¢ per unit.
12 Ordered, 100 units, purchase order 15; expected July 20.
15 Issued 160 units, requisition 125, production order No. 210.
18 Received 50 units, balance of purchase order 10 @ 12¢ per unit.
21 Issued 60 units, requisition 130, Dept. B.
23 Returned to vendor, 20 units from purchase order No. 10, received July 18.
25 Received, 100 units, purchase order 15 @ 10¢ per unit.
27 Freight on purchase order 15, $2.50.
29 Issued 125 units, requisition 140, production order 250.

Problem 7

Construct a stock ledger sheet in accordance with the form required for Prob. 6; enter the same transactions, using the average-cost method of pricing materials issued. Show the balance after each transaction and the inventory value at the end of the month.

Problem 8

Construct a stock ledger in accordance with the form required for Prob. 6; enter the same transactions in accordance with the last-in, first-out method of pricing materials issued. Show the balance after each transaction and the inventory value at the end of the month.

Problem 9

The Globe City Grain Co. does not maintain a perpetual inventory of the two products, wheat and corn, which it buys and sells. The physical inventory taken Sept. 30 shows the following quantities on hand: wheat, 1,000 bu. @ 50¢ per bu.; and corn, 1,550 bu. @ 45¢ per bu.

The following purchases were made during October:

Oct. 1 1,500 bu. of wheat @ 51¢ per bushel.
2 200 bu. of corn @ 44¢ per bushel.
7 100 bu. of wheat @ 53¢ per bushel.
9 150 bu. of wheat @ 55¢ per bushel.
15 1,000 bu. of corn @ 46¢ per bushel.
18 750 bu. of corn @ 47¢ per bushel.
25 250 bu. of wheat @ 53¢ per bushel.
29 800 bu. of corn @ 45¢ per bushel.
30 700 bu. of corn @ 46¢ per bushel.

October 31, a physical inventory indicates that there are 1,000 bu. of wheat and 2,000 bu. of corn on hand. The sales for the month are wheat, $1,100; corn, $1,500.

a. Compute the inventory value and the profit or loss for each product, using the first-in, first-out method.

b. Do the same as required in *a*, using the average-cost method.

c. Do the same as required in *a*, using the last-in, first-out method.

CHAPTER V

WAGE SYSTEMS AND CONTROL OF LABOR COSTS

Proper control and accounting for labor costs constitutes one of the most important problems of management in the operation of a business enterprise and in the determination of the cost to manufacture and to sell a product or service. Accountants have long recognized the importance of adequate systems of controlling and recording payroll costs, yet, because of the expense and trouble involved, many businessmen have been tardy in the establishment of efficient policies and plans. In fact, the enactment of the Federal Social Security Act in 1935 is largely responsible for the management of large and small business enterprises alike reviewing their methods of accounting for labor time and costs and installing more complete personnel and labor cost records.

Problems in connection with payroll control and accounting are so closely interwoven with personnel policies and Federal and state government tax requirements and reports that no divorcement is possible. Fortunately, the payroll statistics required by governmental agencies, by management, and by the cost accountant are practically identical, which makes possible the accomplishment of a threefold purpose by means of a single set of records. Likewise, both management and workers are interested in personnel policies and records which result in amiable relations between the two groups, with low labor costs and efficient production for management and satisfactory working conditions, reasonable hours, and fair wages for workers.

Various types of payroll and employee records are maintained by such departments as:

a. The personnel department.
b. The rate or time and motion study department.
c. The engineering department.
d. The timekeeping department.
e. The payroll department.
f. The cost accounting department.

The type of employee records and the general procedure in controlling labor costs in each of the foregoing departments of manufacturing concerns are described in the present chapter, while the accounting procedure for labor costs and the accounting requirements in connection with the Social Security Program are discussed in the following chapter. Although

the personnel problems and detailed accounting methods vary with the type of business enterprise, the general procedures described are illustrative of the general methods employed.

The Personnel Department.—The personnel director, with the aid of various department supervisors and major executives, is responsible for the execution of policies regarding the employment, discharge, classification of employees, wages, and wage systems which have been predetermined by the board of directors and/or a committee of executives.

The problems of personnel are not concentrated in the personnel department, nor are they exclusively the responsibility of the personnel director. The proper control of personnel requires the attention of every member of the supervisory force from the chief executive to job foremen. The personnel director is a technical adviser, a specialist, and a correlator; he is acquainted with the labor conditions in the industry, the labor policies of the company, the production program, and the needs and problems of the workers. The personnel department in addition to the director, includes interviewers, clerks, stenographers, and one or more employment managers, each of whom is responsible for separate divisions such as sales, production, and administration.

It is a task of the personnel department to interview applicants for positions and to receive formal applications. The application for employment is a record of information about the applicant based upon informational requirements of Federal and state social security laws and requirements of the company. As an aid in selecting personnel the forms are frequently prepared in two copies so that two sets of files of applications can be maintained, one according to alphabet and another according to the firm's classification of labor.

The personnel department should prepare a personnel card or sheet for each worker who is employed. The personnel record contains data regarding the applicant, transcribed from his application blank, and during the period of employment shows the nature of work or positions, wage rates, promotions, or changes in wage classification. The personnel record is a case history which extends from the day a worker is employed until his services are terminated.

An individual compensation record of the time worked, rate of pay, earnings, and deductions for each employee is essential in order to comply with the social security requirements. This record is described in connection with payroll accounting in Chap. VI.

Personnel Policies in Regard to Incentives and Compensation Plans. With the cooperation of the personnel director and his staff, it is a function of management to formulate, initiate, and operate a system of wage-payment plans which will stimulate production and sales, encourage efficiency and economy, and promote good will and satisfaction among

workers. Workers are more responsive and productive when some form of incentive is offered to them for surpassing specified standards of perfection and performance. Incentives offered are generally financial in character, although nonfinancial forms are often used to reward indirect workers such as clerks, stenographers, supervisors, foremen, and salesmen. Forms of nonfinancial incentives include prizes, medals, distinguished service badges, longer vacation time, vacation trips with expenses paid, and promotion to more responsible and remunerative positions. Recognition of meritorious service in the form of public or group reports, such as tabulation of costs, production and sales statistics on charts, on blackboards, or in bulletins, may also be classed as nonfinancial incentives.

Financial incentives, which have received greater consideration and have been more generally applied to the rank and file of workers than have nonfinancial incentives, include any form of compensation that is dependent upon the productivity and efficiency of a worker, executive, or group of workers. They may be applied to any level of the personnel from major executives to the lowest paid worker. Executives frequently are paid regular salaries and bonuses contingent upon sales or production for a specified period, or they are permitted to share in net profits in addition to the regular salary schedule. Minor executives, sales and production supervisors, foremen, and job foremen are rewarded for large sales or production volume, for equaling or surpassing overhead expense budget allotments, or for effecting economies in sales or in production methods by bonuses computed as a percentage of the volume of activity or of savings. Factory and office workers are generally paid in accordance with their productivity in the form of piecework rates of which there are numerous types.

Financial incentives are an important aid to management in the reduction of both labor and overhead costs. Labor costs per unit of production are decreased by increasing the output of each worker or machine. Likewise, since overhead costs, comprised largely of such items as depreciation, rent, taxes, insurance, heat, supervision, and spoiled work, accrue on the basis of time, an increase in production in terms of units by means of incentive wage plans will result in overhead costs per unit of output being reduced.

Employees also are benefited by the operation of incentive plans. The majority of workers prefer to receive compensation commensurate with their productivity because the most efficient workers receive benefit from their initiative, skill, and training. In order that a compensation plan may be successfully employed, it must be fair both to the employees and to the business enterprise.

Wage-payment Plans.[1]—There are so many different types of wage-payment plans in use at the present time that a complete examination of each plan cannot be made in this treatise. However, it is important that the student of cost accounting be familiar with the general characteristics of the more common types. The best known wage systems include:

a. Straight-time method (day wage or salaries).
b. Piece-rates.
c. Combination of time and piece-rate schemes.
d. Wage determination at an arbitrary point within specified limits.

The straight piece-rate plan, the Taylor differential piece-rate system, and the Merrick multiple piece-rate plan are discussed briefly in connection with piece-rate incentive plans; the Halsey gain-sharing plan, the Rowan premium plan, and the Gantt system are used to illustrate the third type of incentive plans; and the Emerson efficiency plan typifies incentive systems classified under the fourth group.

Straight-time Wage Plans.—Although various wage incentive plans are gradually replacing time wages, the straight-time wage persists as the most common form of payment in present use. It provides for the payment of a specified amount per hour, day, week, or month regardless of the amount or quality of the work. When workers are required to work additional hours or days beyond the specified time requirement, generally it is customary for employees to receive compensation at the same rate or at a higher rate for the overtime period.

From the point of view of the worker, the straight-time method has both advantages and disadvantages. There exist the elements of security and certainty which appeal to many workers. Workers can depend upon a definite wage or salary regardless of the amount of work completed or the efficiency of their work, so long as it is above the minimum requirements expected of employees. On the other hand, the method does not give proper recognition or reward to exceptionally industrious and efficient workers whose productivity is above the average of the group. Since a worker receives the same wage whether he is the most productive or least productive of his class, there is little incentive to achieve superior performance. It is true that opportunities for promotion to executive positions or to a higher classification of workers or the fear of discharge may be forms of incentives, but generally they are so remote that their effect on workers is not a positive one.

From the point of view of the employer straight-time wage plans have the advantage of simplicity and economy in timekeeping and pay-

[1] Some of this material has been taken from Watkins and Dodd, "The Management of Labor Relations," Chap. XIX, McGraw-Hill Book Company, Inc., New York.

roll recording. There are no complications of a mathematical character and no counting, weighing, and testing of each worker's output as is required in incentive wage plans. Likewise, in industries in which craftsmanship and skill are important, workers may complete their tasks without the pressure of quantity production methods or the thought that their compensation is dependent upon volume of output. On the other hand, it is estimated that employees work at from 50 to 60 per cent of their possible capacity when they are employed on a straight-time basis. There is no provision to encourage workers to speed up production so that the enterprise will receive the maximum benefits from each employee's activities. When incentives and means of measuring the productivity of workers are lacking, there must be substituted a more complete system of supervision and control of labor operations. Consequently, straight-time wage plans generally result in a higher labor cost as compared with the results of well-planned and efficiently operated incentive wage schemes.

The average and below-average workers favor the straight-time wage plan, while the above-average or exceptional workers favor wage systems which provide for compensation in proportion to the amount of work completed. The straight-time plans are favored by labor unions because standardized wage rates aid in collective bargaining and in negotiations with employers. A number of manufacturers, of whom the most prominent is Henry Ford, favor the method for industries or departments in which machine and assembly processes can be timed and regulated so that each worker must perform the task assigned to him at a given moment in order not to retard conveyers or operations.

The straight-time wage is still the most effective plan for workers such as clerks, accountants, stenographers, factory helpers, members of the supervisory staff and officers whose work cannot be standardized and measured satisfactorily, and highly skilled and efficient workers with whom the quality of work is a more important factor than volume of production.

Piece-rates.—Compensation plans based on the number of pieces or the quantity of production is the most common form of wage payment for direct workers. The total earnings may be entirely dependent upon the work completed, or provision may be made for a minimum base wage or guarantee to protect workers who, during their apprenticeship or the periods of slack production or breakdown of machinery, are in no way responsible for their inability to earn a living wage. Simplicity is an important advantage of straight piece-rates. The total wage is determined by counting or weighing each worker's production and multiplying the total by the piece-rate. It is a method which is easily understood and verified by workers.

Workers are paid in accordance with their productivity when piece-rates are in use. Employees of superior ability and training are encouraged to increase their productivity and total compensation, which reacts as a benefit both to the individual worker and to the business enterprise. A competitive situation usually develops among workers in each group, and the few energetic and highly efficient workers tend to stimulate increased activity and to raise the standard performance of the group. A study made by the National Industrial Conference Board of piece-rate systems in 1,214 plants, employing 777,376 workers, discloses that the use of piece-rate systems resulted in an average increase in production of 30 per cent, an increase in average earnings of 25 per cent, and a decrease in per unit production costs of 21 per cent; in individual plants increases in output varied from 10 to 400 per cent, increased earnings ranged between 10 and 199 per cent, and unit cost decreases ranged between 10 and 50 per cent.[1]

Piece-rates are of advantage to management in the following respects:

a. A reduction in the need for managerial supervision, since each worker assumes responsibility for his own time and output.

b. A lowering of overhead costs per unit of production, because of the increased volume of production.

c. A lowering of labor costs per unit, due to the increased output.

d. The computation of labor costs in advance of production is made possible, since the fixed rate per unit or job has been determined.

e. Personnel control is aided by the isolation of submarginal employees whose work is inefficient and below the minimum standard requirements of the enterprise.

The use of piece-rates is by no means a perfect wage plan. It tends to emphasize quantity rather than quality and requires minute inspection of finished products. Generally the amount of imperfections, spoiled work, and defective parts is increased and higher depreciation costs result from the fact that machinery and equipment are subjected to greater wear and tear. Frequently workers are laid off or their compensation is reduced due to lack of work, repairs of machinery, and breakdowns.

One unsatisfactory feature of piece-rates is the tendency for management to adjust rates when it appears that workers are making high wages. In some cases the reduction of rates may be justified because they were improperly set, but too frequently a cut in rates is made so that the level of wages in one department will not be above those of other departments. Piece-rates should be established only after time and motion studies have been carefully made and tested. The rates so determined should be guaranteed to workers until there has been an important change

[1] "Systems of Wage Payments," p. 37, National Industrial Conference Board, Inc., New York.

in the character of the product, the type or quality of materials, or the methods of production. Watkins and Dodd give the following principles which should govern rate determinations and revisions:

1. When greater production is the result of greater application and effort and the exercise of greater intelligence on the part of the workers, there should be no objection to increased total earnings per man, and rates should not be revised.
2. When increased output and earnings are the effect of technical changes introduced by management, such as a change in the ratio of machine work to hand work in the operation, there is justification for rate adjustments.
3. When the income of pieceworkers is extraordinarily high or low compared with the earnings of other employees who spend the same amount of time, energy, skill, and intelligence on their work, even if the ratio of mechanical to human factors remains the same, there is reason for consideration of rate revision. In other words, if the earnings under established rates are inadequate to maintain a decent standard of living, or if they are so high as to be out of any reasonable proportion to the amount of effort, intelligence, or skill involved, readjustment in rates is not objectionable.
4. Original rates should be set and all revisions made by joint committees of representatives of management and men cooperating with the rate-setting expert. This will create confidence in the plan, promote justice, and preclude abuses.

Taylor Differential Piece-rate Wage Plan.—The Taylor plan is a refinement of the straight piece-rate system. Different piece-rates are established for the same worker or group of workers for different quantities of production; one piece-rate is set for production below a set standard, while another rate applies when a worker's production is equal to or above the standard. The standard production per hour may be 100 pieces; the piece-rate per unit for production 1 cent per piece; and the rate per piece for standard or above standard production 2 cents. The wage per hour for three workers is shown in the table below.

Worker	Production, pieces per hour	Rate per piece, cents	Total pay per hour
A	50	1	$0.50
B	99	1	0.99
C	125	2	2.50

The plan provides no minimum pay for workers. It is based on the supposition that differential rates encourage greater production. It favors the most efficient workers by permitting them to obtain high wages, and discourages submarginal workers who cannot attain standard. It is assumed that, by time and motion study methods, a scientific investigation is made of each job, and that a standard is determined

which is possible of attainment and which is a measure of above average ability, industry, and intelligence of workmen.

The Taylor plan has the advantage of attracting exceptional workmen. The success of the method depends upon the ability of management to scientifically set the standard for each task. Its use in the United States has been limited in part because of the cost involved in preliminary time and motion studies required to set standards and in part because of dissatisfaction created among workers by its use. Generally the standards are set at such a high point that only the exceptional workman receives any benefits; as a result, the majority of workers are discouraged and disgruntled. It has the advantage over the straight piece-rate in that an additional form of incentive is included and, generally, there is no arbitrary revision of rates even though workers are able to earn large wages.

Merrick Multiple Piece-rate Plan.—A modification of the Taylor wage plan is known as the Merrick plan which, in theory and general principles, is identical with the Taylor plan. It differs in that, instead of using two piece-rates—one for substandard production and another for above-standard performance—there are three levels of piece-rates. Thus there may be two rates existing below the standard, one for apprentices and another for the majority of workers, while a third is maintained for the exceptional worker who equals or betters standard performance. For example: the standard production per hour may be 100 units; the piece-rate for production totaling 49 pieces, 1 cent per piece; the rate for production up to 100 pieces, 1½ cents; and production equaling or in excess of the standard of 100 pieces, 2 cents per piece.

The plan has advantages both to employees and to management. It is favorable to workmen because a greater number are permitted to participate in the incentive plan through the grading of workers in the substandard classification. There is established a cooperative spirit between workers and management, because there is a division of savings through highly efficient production. There is also a minimum wage guarantee, which is of benefit to newly employed workers and to experienced workers who are not employed full time owing to slack production, repairs, and breakdowns. It offers an incentive to superior workers who are enabled to increase their wages. From the point of view of management it is simple and economical to install and operate. It can be adapted to a large variety of types of tasks and operations, including those which are not completely standardized. Rates may be revised easily without incurring the animosity of employees when production methods and volume change. It has proved to be an effective means of increasing profits by increasing production and decreasing overhead costs.

GAIN-SHARING PLANS

This group includes such wage-payment plans as the Halsey gain-sharing plan, the Rowan premium plan, the Gantt task and bonus system, and the Bedaux point system, all of which are designed as a combination of time and piece-rates with gains shared jointly by employees and employers.

Halsey Plan.—The Halsey plan provides for a guarantee to workers of a minimum day wage, and permits them to share with management in savings resulting from production in excess of the set standard. It is one of the oldest types of incentive plans and is based on the theory of the originator, F. A. Halsey, that a workman should receive a bonus equal to an amount ranging from one-third to two-thirds of the value of time he saved in production. A standard time is determined for each operation or assignment as the basis for bonus computation. A rate per hour is established and applied to each worker's time, which constitutes the worker's regular wage unless the total wage so determined is below the minimum wage established. In addition to the regular wage the worker receives a bonus, computed upon an hourly basis and dependent upon the time saved and the nature of the job. For example: it is assumed that the standard production per hour is 100 pieces; the wage rate is $1 per hour, and workers are entitled to a bonus equaling 50 per cent of the value of the time saved. If a worker produces 100 pieces in 45 min., his compensation is computed as follows:

45 min. of work at $1 per hour	$0.75
50% of value of time saved (15 min. at $1 per hour)	0.125
Total compensation for 45 min	$0.875

The plan is criticized on the grounds that it is not scientific. It is contended that standardized conditions are not determined for each job; that the worker does not receive a proper share of the savings which he makes possible, and that management reaps benefits from his skill, industry, and intelligence; that too frequently the gains result from technological improvements made in machinery and in methods by the company rather than from economies effected by the workers; and that workers tend to neglect jobs for which no bonus is paid and to speed up work on jobs covered by the extra-compensation plan.

Rowan Premium Plan.—This plan of wage payment is basically like the Halsey system. It differs in that, instead of sharing with the business enterprise the value of time saved, workers receive a specified percentage of the standard wage rate in proportion to the amount of time saved. It is similar to the Halsey system in that a standard time is set for each operation, based on past experience; a minimum day wage is in

effect for workers who are substandard; and there is a maximum or upper limit beyond which wages cannot go.

The plan is operated in the following manner. An investigation is made of the existent labor conditions and of the time required for each operation from time and production records; a standard time is set for each task and operation; and a wage rate per hour is established for each labor classification. Workers are paid for each hour of employment at the regular wage rate per hour, and in addition are given a bonus, which is computed as a percentage of the wage rate, based on the amount of time saved over the standard time allowance. If a worker can complete a task with a 10 per cent saving in time over standard time, he is entitled to a bonus of 10 per cent of his wage rate; if he can save 25 per cent of the standard time allowance, his extra compensation is 25 per cent of the regular wage rate. For example: if a worker is assigned a job for which the standard time is 8 hr. and the regular hourly rate is $0.50 and he completes the work in 6 hr., there has been a saving in time of 2 hr. or 25 per cent. His total income consists of the regular wage of $3 (6 hr. at $0.50 per hour) plus a premium of $0.75 (25 per cent of $3), or a total wage of $3.75. If he completes the task in 4 hr., there has been a saving of 4 hr. or 50 per cent, and his compensation consists of a regular wage of $2 (4 hr. at $0.50 per hour) and a premium of $1, or a total wage of $3. Thus he receives a premium of $0.75 for a saving in time of 25 per cent and only a $1 premium, or $0.25 additional for a 50 per cent saving in time. The proportional amount of premium decreases with the amount of savings.

Most of the objections to the Halsey plan can also be applied to the Rowan system. It is not a scientific wage plan in that it is generally based on past experience rather than on carefully prepared time and motion studies. From the workers' point of view, it is complicated; it does not give them an equitable share of the savings that they create; and the amount of premium decreases proportionally with an increase in time saved, thus discouraging savings in time beyond a certain point.

The Rowan plan has not been widely adopted in the United States, but, as is true of the Halsey wage system, it has been used by a number of enterprises for an interval of time during a transition from day rates to more scientific incentive plans.

Gantt Task and Bonus System.—This system of wage payment is typical of a group of plans, differing only in minor detail, which provide for a combination of time and piece-rates. The general principles of the Gantt plan may be outlined as follows:

a. A standard time is determined for each class of work or operation.
b. An hourly rate is set for each class of workers.

c. Workers who complete tasks within the standard time are paid an amount consisting of the full-time allowance, multiplied by the hourly rate, plus a bonus computed as a percentage of the time.

d. A bonus system is employed for foremen by which they receive extra compensation based upon the number of workers equaling or surpassing standard requirements.

The amount of the bonus varies with the individual concern, but it typically ranges between 20 and 50 per cent of the standard time. For example, it may be assumed that the regular wage rate is \$0.50 an hour and the bonus is 20 per cent of the standard time. If a workman completes in 7 hr. a task for which the standard time is 6 hr., he is not entitled to a bonus, and his wage for the job is \$3.50, the \$0.50 an hour rate multiplied by the actual hours consumed. If a workman completes the job in the standard time of 6 hr., he is entitled to a regular wage of \$3 (6 hr. at \$0.50 an hour) plus a bonus of 20 per cent of 6 hr., the standard time, amounting to \$0.60, or a total wage of \$3.60. If a workman finishes the work in 5 hr., 1 hr. under standard time, he still receives credit for the standard time of 6 hr. or a regular wage of \$3 for the job. In addition he is entitled to a bonus of 20 per cent of the standard time or \$0.60 which gives him a total wage of \$3.60 for the job. However, in this last case, he has saved 1 hr. of his time by completing the work in less than standard, which permits him to work the extra hour on another job for which he will receive compensation, making his total daily income larger.

The Gantt compensation plan guarantees a minimum day rate to those workers whose productivity is below standard and, at the same time, provides a definite incentive in the form of a bonus to those who can achieve or surpass standard requirements. In addition there is an established system of incentives for foremen as an inducement to them to aid and supervise workmen so that standard will be attained. For example, a foreman in charge of a crew of five men may receive a premium of 10 cents for each man who equals or surpasses standard and 12 cents for each workman if all members of the group attain standard. If four men in the group are able to do standard work, the foreman in charge is entitled to a bonus of 40 cents; if all five members of the crew reach standard, the foreman's bonus is 60 cents. The Gantt system has been used successfully by many concerns. It encourages foremen to be interested in the success of the men under their direction, to train and encourage workers, and to recommend the transfer to other occupations of employees not suited to a particular job. The system is so planned that the standard time requirements are based on the work and conditions surrounding the average or slightly above-average workers in order that bonuses may be obtained by the majority of workers. Its unsuccessful

application has been due largely to the improper determination of standards of performance through the lack of unscientific measurement of time and motion factors.

Bedaux Point System.—This compensation plan is one of several recent schemes based on points as a common denominator upon which all types of work can be set. The point, or Bedaux (B), is the common unit for measuring human effort. It represents the amount of actual accomplishment plus a reasonable allowance of time for rest and necessary delay, the total of which can be attained by an average worker in performing a certain operation correctly under normal conditions. It is measured in terms of minutes and the number of B units produced in 1 hr. is used as a measurement of the work accomplished by individual workers, operations, and departments. A point standard, which represents the number of points allowed, is set for each type of work or operation by means of time and motion studies. Thus there is established a unit of measurement by which accomplishment can be measured and workers can be paid.

The compensation plan varies with the individual company. It is customary to have a guaranteed minimum rate for workers who cannot attain the standard of 60 B's an hour and to pay a premium for each B in excess of 60. In some cases the full premium is paid to workers, but in other cases a portion of the premium is paid to supervisors. If a worker's output is less than 60 B's an hour, he is paid an amount equal to the actual hours multiplied by the hourly rate with no premium allowance. If his production is in excess of the standard of 60 B's an hour, the following method of computing his total income is used:

$$\text{Total earnings} = \text{actual hours} \times (\text{bonus} + \text{hourly rate}).$$

$$\text{Bonus} = \frac{\text{hourly rate}}{60} \times \text{premium points (actual B's per hour} - 60).$$

The Bedaux point system is rather complicated in its daily computation of wages and is expensive to install and to revise. It requires close supervision and is difficult for workers to understand. It is, however, a good incentive plan since it guarantees a minimum wage, offers a medium of accurately measuring worker's productivity, and compensates both workers and supervisors for exceptional performance.

Emerson Efficiency Plan.—This plan is typical of several wage systems which incorporate two variables. The Emerson plan provides for a guaranteed daily wage regardless of the amount of productivity of workers and is differentiated from other systems by its inclusion of a plan of additional compensation whereby workers are rewarded according to a graduated scale of improvement in production.

Watkins and Dodd[1] explain the operation of the system as follows:

Under the Emerson, the following procedure is involved: a task time is set for each operation or group of operations; an hourly rate is provided for each worker; a table of bonuses indicating the incentive reward for varying degrees of efficiency is worked out; and a workman is paid a specified hourly rate for each hour that he works and, in addition, receives a percentage of this rate in accordance with his demonstrated efficiency. The day rate is paid, together with a gradually increasing bonus, after an output of 66.6 per cent of the standard has been attained, as is indicated in Exhibit 19.

EXHIBIT 19
EMERSON EFFICIENCY PLAN SIMPLIFIED BONUS TABLE

Percentage of efficiency	Percentage of bonus	Percentage of efficiency	Percentage of bonus
67.00–71.09	0.25	89.40–90.49	10
71.10–73.09	0.50	90.50–91.49	11
73.10–75.69	1.00	91.50–92.49	12
75.70–78.29	2.00	92.50–93.49	13
78.30–80.39	3.00	93.50–94.49	14
80.40–82.29	4.00	94.50–95.49	15
82.30–83.89	5.00	95.50–96.49	16
83.90–85.39	6.00	96.50–97.49	17
85.40–86.79	7.00	97.50–98.49	18
86.80–88.09	8.00	98.50–99.49	19
88.10–89.39	9.00	99.50 and over	20

It will be observed that the bonus, instead of starting when the standard, or 100 per cent efficiency, is attained, begins at 66.6 per cent efficiency, thus providing a reward for the attempt to reach the standard as well as assuring a high bonus for exceptional service. For efficiencies of 66.6 per cent and below, the worker is paid a daily wage only. From 66.6 per cent to 100 per cent efficiency, the workman is paid his hourly rate for the time he actually works plus an increasing bonus according to his degree of efficiency. Above 90 per cent efficiency, the bonus increases 1 per cent for each 1 per cent increase in efficiency until 100 per cent is reached. For efficiencies above 100 per cent, the workman is paid his hourly rate for the time he has worked plus a bonus comprising two parts, as follows: (a) the full hourly rate for all the time saved; and (b) 20 per cent of the wages for the time worked. Reward is strictly on the basis of efficiency above the minimum day rate, as is illustrated in Exhibit 20.

The percentage of efficiency is the ratio between standard time and actual time, that is, between the time limit set for the job and the amount actually consumed by the worker in completing it. Consequently, a worker's efficiency is determined by dividing the sum of standard time by the total actual time taken. Thus if, during a period of 2 weeks, a worker has an actual working

[1] WATKINS and DODD, "The Management of Labor Relations," pp. 376–378, "McGraw-Hill Book Company, Inc., New York.

EXHIBIT 20
EARNINGS UNDER THE EMERSON EFFICIENCY SYSTEM

Worker	Standard time	Actual time taken	Efficiency, per cent	Base wage	Bonus, per cent	Total job wage	Actual earnings per hour	Total wages, 2 weeks[1]
A	80	120	66.6	$48	....	$48.00	$0.40	$48.00
B	80	100	80.0	40	1.60	41.60	0.415	49.80
C	80	90	88.8	36	3.24	39.24	0.435	52.20
D	80	80	100.0	32	6.40	38.40	0.48	57.60
E	80	70	114.2	28	9.60	37.60	0.535	64.20

[1] Assumes a 10-hour day and sustained production.

time of 90 hours on jobs for which the total standard time is 80 hours, his efficiency is 89 per cent. If in the same time he had completed jobs involving total standard time of 100 hours, his working efficiency would have been 111 per cent. A worker is 100 per cent efficient when he completes the work in the standard time set for it. Those who are unable to achieve an 80 per cent efficiency are assumed to be misplaced and at the earliest opportunity an effort is made to assign them to work suited to their capacities. Exhibit 20 indicates how earnings are adjusted to efficiency under the Emerson system.

The successful application of the Emerson plan requires a scientifically developed organization with a time and motion study division, standardized factory machine and hand operations, and carefully determined wage rates. The plan is favored as a wage system because it is fair to both employees and employers. Workers receive the advantage of a minimum day wage and the bonuses, graduated according to efficiency, permit the realization of a monetary reward. The plan is available to all classes of workers and does not benefit the exceptional workers only. From the point of view of management, the plan offers adequate incentives and raises the average efficiency and productivity of workers. Its operation is rather expensive and complicated, and the budgeting of output and labor costs presents difficulties because responsibility for production is somewhat dependent upon workers.

The Wennerlund and the Knoeppel incentive schemes are similar to the Emerson plan.

Rate or Time and Motion Study Department.—The success attained in the use of wage systems in factories is largely dependent upon the efficiency of the rate department, frequently termed the "time and motion study department." This division, which operates in close harmony with the personnel and the engineering departments, has as its chief functions the preparation of time and motion studies of labor and plant operations, setting piece-rates, and making job analyses.

A time study is a measurement of a labor operation by means of an analysis of the various movements and activities composing the task. Time studies are made by specially trained engineers whose observations are usually timed by means of a stop watch. Generally 10 to 12 observations are made of each labor operation and an average time is computed. A standard time represents the time allowed, with consideration being given to absolutely essential labor movements, proper tools, and trained, efficient, and skilled workers. In some enterprises time studies are supplemented with motion studies, which consist of motion pictures of labor operations. The developed pictures are a means of studying operations in order that unnecessary movements may be eliminated and the most efficient methods may be adopted. The films may be run for groups of workmen so that they may pattern their methods in accordance with those used by the most efficient workmen.

The standard time for each labor operation is used as a basis for the determination of wage rates in the operation of incentive wage systems, in the preparation of estimates of labor costs, and in the establishment of standards of efficiency. A time-study card showing time allowances in terms of a decimal part of an hour is generally prepared for each labor operation. Time studies are made whenever there is a new labor operation or when there has been a change in machines, in methods of operation, or in types of labor employed. Existing rate schedules should be reinvestigated at frequent intervals by means of time and motion studies to prove their accuracy.

Another important function of the rate department is the preparation of a description and classification of each job, with a list of the qualifications needed by workers to perform the work satisfactorily. In order to secure this information each job is carefully analyzed, its peculiarities noted, and the workmen's training, experience, and skill are studied. Such job analyses permit the personnel department to catalogue its labor requirements and to assign the best available man to each job.

Engineering Department.—This division, which in large enterprises is subdivided into several separate departments, is responsible in the production of an article for such important functions as follow:

a. Preparation of plans and specifications for each job scheduled for production.
b. Supervision of production activities within production departments.
c. Inspection of parts and jobs at successive stages of production and at the completion of production.
d. Initiation and supervision of research and experimental work.
e. Safety and efficient working conditions.

Timekeeping Department.—In many enterprises the function of timekeeping is performed by the payroll department, but in large concerns

a separate division is generally maintained. The timekeeping department is usually a decentralized organization with time clerks, who are responsible to the head timekeeper or supervisor, located in the various service and production departments. Although foremen are often too busy with other more important duties to act as timekeepers, frequently they are required to check and initial time reports, which virtually makes them responsible for timekeeping. Timekeeping is generally indirectly under the supervision of the factory or office superintendent and is directly under the supervision of the cost department or payroll department. It is generally more effectively handled when under the direction of the cost accountant since there is an important relationship between time records and the cost accounting system. The paymaster is responsible for timekeeping when the payroll and timekeeping functions are centered in a single department. The timekeeping task consists of obtaining an accurate record of each worker's time in and out of the plant each morning and afternoon during regular working hours and overtime during irregular working periods, and of reporting the time of each employee for each department, operation, and production order.

Different methods of recording employee time in and out of the factory and office are in use. The most modern type consists of a mechanical time recording device known as a "time clock" or "time recorder." Each worker is assigned a clock number which is used in identification, in preparing payrolls, and in classifying labor time by departments and by production orders. At the beginning and close of each morning and afternoon a daily time card showing the worker's name, clock number, and department is placed in a rack, located at a convenient distance from the time clock. When an employee arrives or leaves he inserts the card in the time clock device, and the time and date are recorded on the card, which he places in another rack located on the other side of the recorder or in his department. In some concerns the time clock is closed at a specified time and employees who are late must report to the timekeeping department before they are permitted to work; in others, the time clock records the late period in red. According to one plan the time cards are used by the timekeeping department as a posting medium to payroll sheets or to summary time cards and as a means of checking the total time of factory employees.

A second plan of time recording consists of using a metal disk which contains an identification number for each employee. A board containing hooks to which employees' disks are attached is located near the entrance to the plant. Upon entering the plant each working period, an employee removes his disk from the board and carries it to his department where he inserts it on a hook on a smaller board which contains his identification number. Later a representative of the timekeeping depart-

ment removes the disk from each department board, records the numbers of the workers who have appeared for work, and transfers the disks to the large board at the entrance where they will be available to workers when they report at the beginning of the next work period. If employees leave the plant before the regular closing time, they must give to watchmen in charge of each exit their names, identification numbers, and their reason for leaving.

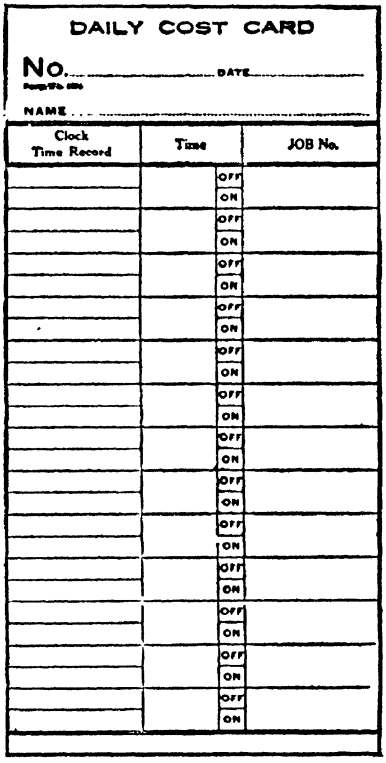


EXHIBIT 21.—(*Courtesy of International Business Machines Corporation.*)

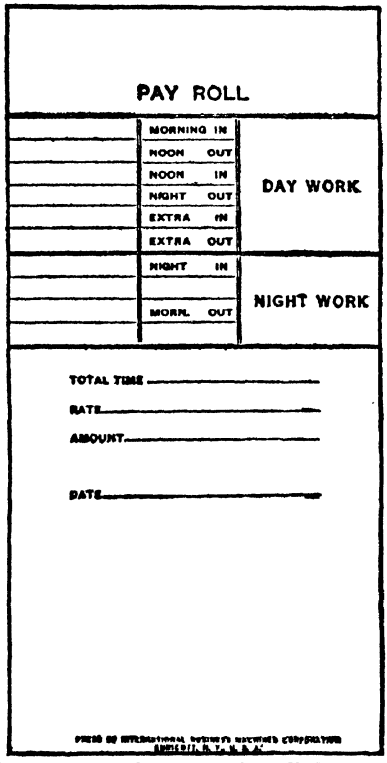


EXHIBIT 22.—Reverse side of Exhibit 21.

In some concerns timekeeping is still performed by regular timekeepers or by foremen or clerks specially commissioned to account for the time of employees. The plan is less efficient than either of the two others because of the human element involved which frequently results in inaccuracies. If the services of regular timekeepers are required, the timekeeping cost is comparatively greater than when time clocks are in use.

The second task of the timekeeping department is to properly account for the time of each employee in terms of departments, operations, and production orders or jobs. The classification of workers' time may

be obtained through the use of the daily time card for each worker. The time card can be prepared to show, in addition to the department, the worker's name, identification number, and the time in and out for the day, the time required for each production order or operation, the total labor time, the wage rate, and the total wage earned for the day. A form of daily time and cost card is shown as Exhibits 21 and 22.

The time required for each production order or operation may be recorded mechanically by the employee who inserts his time card in an electric job time recorder when he starts and completes each assignment; or, if a time recorder is not used, the recording of time may be done by a timekeeper, by a foreman, or by the worker himself. The recording of the time by the job time recorder and by a regular timekeeper are the most satisfactory methods. Foremen have other duties to occupy their time, and workmen frequently are careless or negligent in charging their time to operations or jobs. Labor time must be properly classified and accurately recorded in order that the labor cost data prepared by the cost accounting department may be of value to management.

Payroll Department.—If the functions of the payroll department exclude that of timekeeping, the following are its main duties:

a. To maintain a record of the job classification, department, and wage rate for each employee.

b. To verify and to summarize the time of each worker as shown on the daily time cards.

c. To compute the wages earned by each worker.

d. To prepare the payroll for each department showing the total amount earned for the period by each employee.

e. To compute the payroll deductions required by the Federal Social Security Act and state unemployment compensation laws.

f. To maintain a permanent payroll record for each employee.

g. To disburse salary and wage payments.

h. To calculate the benefits to be paid to each employee.

As a form of internal check each employee added to the payroll should be required to sign his name on a signature card which can be compared with signatures on payroll checks, payroll signature sheets, or pay envelopes. The card generally contains date of employment, labor classification, department, age, and the wage rate.

Time cards are the basis for the preparation of payrolls. Departmental payroll sheets, which constitute the recapitulation of data appearing on daily or weekly time reports, are summarized in a master payroll sheet which forms the basis for the preparation of the payroll voucher entry and the posting to cost controlling accounts in the general ledger.

In many organizations the preparation of payrolls and the payment of workers are planned so that the payroll department may "stagger" its activities. Thus one department or division may close its week on Mon-

day and employees may be paid Wednesday; a second department may close its week on Tuesday and payments may be made Thursday; and so on through the week so that there is an even flow of payroll work. The method of payment varies with the business organization. In some concerns paymasters actually pay employees while they are at work; in other enterprises pay windows or pay booths are arranged conveniently. Payment of wages by check is a satisfactory means of payment because the payroll department is not concerned with handling large sums of money and making change; likewise the canceled checks serve as receipts. When workers are paid with cash, a pay envelope, containing a detachable section, is generally used. Employees sign the perforated section of the pay envelope and give it to the paymaster as a receipt. In other concerns employees sign a payroll sheet or a receipt card when they receive their compensation. The payroll department, even though it is a separate division, must cooperate with, and report to, the comptroller, general accountant, cost accountant, superintendent, auditor, and various department heads.

Cost Accounting Department.—The cost accounting department is responsible for the accumulation and classification of all cost data of which labor costs is one of the most important elements. In some enterprises cost accounting activities are decentralized and the cost accountant acts largely in the capacity of an organizer and director in the accumulation of payroll information and labor costs. Time tickets are prepared by the payroll department. The cost accountant supervises the work performed in the various departments and uses the summarized time tickets and payroll information in his computation of costs of production or services by departments, operations, production orders, and territories. Frequently representatives of the cost accounting department are located in large production departments to aid in accumulating and classifying labor costs.

In other concerns the activities of the cost department are highly centralized, and cost analyses and reports of labor costs are prepared from original or duplicate copies of time cards. The cost department has a close relationship to, and an active interest in, the activities of the timekeeping department. The timekeeping department sends either the original or duplicate copies of daily time tickets to the cost department where they are costed and checked as to total time in the factory as well as labor distribution.

In most cases it is customary to analyze the total labor time into direct and indirect labor by departments or processes. Direct labor may be subdivided into piecework, day work, overtime, bonus, or premium and in manufacturing concerns is chargeable to production directly. Indirect labor is classified by the same types of compensation but is treated as indirect expense or overhead expense; it is charged immedi-

ately to expense accounts or standing orders and indirectly charged to production by means of overhead expense distribution rates. The direct labor hours or direct labor costs, recorded on daily time cards, are generally used in factory cost accounting as a basis for the distribution of factory overhead expense to production orders. The cost department is responsible for the preparation from daily time cards of regular or special labor reports such as payroll analyses, labor-efficiency reports, idle-time reports, and wage incentive reports.

A discussion of payroll records and accounting entries required for labor costs is reserved for Chap. VI, where a description is given of the salient tax requirements of the Social Security program and their connection with payroll accounting.

Questions

1. Why is the proper control of labor costs of importance to the cost accountant? What departments are responsible for controlling labor costs and maintaining personnel records? What functions are performed by each department?

2. What important functions are the responsibility of the personnel department? What types of personnel records should be prepared and maintained by this department?

3. Why is a knowledge of wage-payment plans of value to the cost accountant? What are the major forms of wage-payment plans in use in manufacturing concerns?

4. Discuss the straight-time wage plan showing its importance, its applicability, and its advantages and disadvantages.

5. What are piece-rates. How are they computed and applied to various types of work? What advantages and disadvantages are attributed to their use? What principles should govern the determination and revision of piece-rates?

6. Describe the Taylor differential piece-rate wage plan.

7. Describe the Merrick multiple piece-rate plan. How does it differ from the Taylor plan? What are its chief advantages and disadvantages?

8. Compare the Halsey and Rowan premium plans, explaining their similarities and differences.

9. Briefly explain the important features of each of the following wage systems:

a. The Gantt task and bonus system.

b. The Bedaux point system.

c. The Emerson efficiency plan.

10. What are the functions performed by the rate department? How are time and motion studies made of labor and plant operations?

11. What are the important duties performed by the timekeeping department? Describe two different plans of recording employee time in and out of a factory or office?

12. What methods may be used to record the time of employees by departments, by operations, and by jobs? What types of time and labor cost records can be used?

13. Exclusive of timekeeping, what are the functions performed by the payroll department? How do its duties differ in a retail department store compared with a manufacturing concern?

14. What functions does the cost accounting department perform in controlling and accounting for labor costs?

Problem 1

The Varnum Steel Products Co. was founded 30 years ago by T. M. Varnum. The founder has been a rigid adherent of the straight-time wage plan for all classes of employees. Office personnel and salesmen are paid a weekly wage; factory workers are paid a daily wage. The company was operated successfully until 1932. Since that time, competition and depression conditions have caused a decreasingly yearly profit; since 1937 the company has been operating at a loss.

T. M. Varnum has retired, and his son has assumed active control of the enterprise. Among several changes that are recommended to him by the board of directors is the adoption of incentive wage plans for salesmen and factory personnel so that productivity will be increased and the cost of labor per unit of output and per sale will be decreased.

You have been asked to investigate the labor situation in the company and to make definite recommendations as to a wage incentive plan for each group of employees. Your investigation discloses the following facts:

1. The company sells 20 different standard steel products to hardware jobbing concerns and to a selected number of large hardware independent units and hardware chains. The company also builds large refrigeration units which are sold to grocery stores, meat markets, and dairies. In addition to these regular products, the company manufactures various types of steel cabinets and machine products according to special order from individuals and other manufacturing concerns. The company has built up a reputation for its custom-made products.

2. There are 10 regular salesmen, each with a well-defined territory. They are responsible for selling the 20 standard products and only incidentally attempt to sell refrigeration units and take orders for custom-made products.

3. There are two specialty salesmen who sell refrigeration units exclusively and who have no territorial limitations.

4. The factory consists of three divisions: the foundry, the machine shop, and the refrigeration department. The foundry personnel is composed of 1 foundry superintendent, 3 foremen, and 50 workers; the machine-shop personnel comprises 1 superintendent, 6 foremen, 60 skilled machine operators, and 20 unskilled workers, termed "helpers"; the refrigeration department is manned by 1 superintendent, 4 foremen, 20 cabinet workers, 10 electricians, 15 painters, and 10 helpers; the office personnel consists of 1 accountant, 3 bookkeepers, 1 credit man, 3 timekeepers, 4 clerks, 1 general superintendent, and 1 salesmanager.

5. In addition to the regular personnel, there are five workmen who have worked for Mr. Varnum since the inception of the enterprise. They are responsible for the special cabinet and machine work which is processed only on special order. The company's reputation for special order work is largely due to the craftsmanship of these five workmen.

6. In both the foundry and refrigeration department, the group plan is followed, *i.e.*, a foreman supervises crews of 4 to 10 workers who are assigned definite schedules of work.

Present in detail what you consider to be the best wage-payment plan for each group of workers. Explain the benefits which will accrue to each group and to the company from each plan that you select.

Problem 2

The Dayton Motor Co. pays its workers according to the Merrick multiple piece-rate plan. There are three levels of piece-rates: 25 to 50 units per hour, 1¢ per unit; 50 to 75 units per hour, 2¢ per unit; and 75 units or over per hour, 2½¢ per unit;

minimum wage, 25¢ per hour. The piece-rate cards for two workers for Jan. 10 show the following information:

Hours of the day	John Doe, units completed	Richard Roe, units completed
1	25	35
2	30	40
3	35	50
4	Idle time	52
5	32	55
6	20	Idle time
7	18	70
8	28	78

Compute the wage for Doe and Roe for Jan. 10.

Problem 3

The following labor conditions relate to various types of wage-payment plans. Compute the daily wage in each case.

1. Company A pays its workers 80¢ an hour for an 8-hr. day with time and one-half for overtime. Jones works 10 hr.

2. Company B employs a straight piece-rate wage system; the rate is 10¢ a unit. Smith produces 85 units during an 8-hour day.

3. Company C uses the Taylor differential piece-rate wage plan; the standard production per hour is 10 units; 5¢ per unit is paid up to standard and 6¢ per unit for standard or above standard production. Brown's time and production card for a day shows: first hour, 8 units; second hour, 12 units; third and fourth hours, idle time; fifth hour, 15 units; sixth hour, 14 units; seventh hour, 9 units; eighth hour, 7 units.

4. Company *D* employs the Merrick multiple piece-rate plan. The minimum wage is 30¢ an hour. Standard production is 40 units per hour; the rate for production up to 25 units is 2¢ per unit; the rate for production up to 40 units is 2½¢ per unit; and the rate for production equaling or in excess of 40 units is 3¢ per unit. White's productivity record per hour for a 7-hr. day is as follows: first hour, 24 units; second hour, 27 units; third hour, idle time; fourth hour, 36 units; fifth hour, 43 units; sixth hour, 42 units; seventh hour, 45 units.

5. Company E uses the Halsey compensation plan. The guaranteed minimum day wage is $5. The standard rate is $1 per hour and the standard production is 50 units. A 50% premium is given for better than standard performance. Hall's production record each hour of a 6-hr. day is as follows: first hour, 50 units; second hour, 52 units; third hour, 58 units; fourth hour, 60 units; fifth hour, 55 units; sixth hour, 40 units.

6. Company F pays its workers according to the Rowan premium plan. The minimum day wage is $4 and the maximum wage is $10. The standard rate per hour is 80¢ and the standard production is 40 units per hour. Workers receive a premium proportional to the time saved. Morrison's productivity for a 6-hr. day is as follows: first hour, 40 units; second hour, 44 units; third hour, 42 units; fourth hour, 50 units; fifth hour, 60 units; sixth hour, 45 units.

7. Company G employs the Gantt task and bonus plan. The minimum day wage is $5; the standard time to assemble a certain machine is 8 hr.; the standard rate is 60¢ an hour. A bonus of 30% of the standard time is offered to workmen. Hansen succeeds in completing a machine assembly in 6 hr. and spends the 2 hr. remaining in his 8-hr. day in assembly work on a second machine.

CHAPTER VI

PAYROLL ACCOUNTING

The major objectives of a system of payroll records should be to provide:

a. An accurate record of the personnel of business enterprise, including personal information, type of work, hours and days of work, rate of pay, and amount of salary or wages paid. Such a record tends to prevent padding of payrolls and provides complete information concerning each employee.

b. A proper classification and distribution of labor costs within the enterprise, which includes charging particular production orders, departments, operations, and territories.

c. Information required for governmental reports such as those in compliance with the social security program. The payroll records should be kept in such a manner that governmental reports can be readily and easily prepared at the proper time.

Payroll Accounts and Accounting Procedure.—In small enterprises a single payroll account is frequently used as a controlling account in the general ledger to summarize all labor costs. In larger enterprises payroll costs are more minutely classified through the use of such accounts as follow: Factory Payroll, Factory Bonuses, Office Salaries, Officers' Salaries, Sales Salaries, and Sales Commissions. The supporting records consist of weekly or semimonthly payroll sheets, bonus reports, and commission statements which are prepared from daily time cards, piecerate reports, and analyses of sales.

It is customary to prepare a voucher each payroll period for the total amount of wages and salaries, based on the payroll summaries for the period, and to enter the payroll voucher in the voucher register as a charge to various payroll and salaries accounts and as a credit to Vouchers Payable. The entry in the voucher register in terms of debits and credits appears as follows:

Factory Payroll	xxx	
Factory Bonuses	xxx	
Administrative Salaries	xxx	
Sales Salaries	xxx	
Sales Commissions	xxx	
Vouchers Payable		xxx

When payment is made by company checks prepared by the paymaster, cashier, or disbursing officer, an entry is made in the check register or cash disbursement journal as follows:

Vouchers Payable	xxx	
Cash (or Bank)		xxx

Usually a single line is used showing the block of check numbers, such as "checks 18,200 to 19,000," required in disbursing the week's payroll. If payroll checks are drawn on a special payroll bank account, the procedure is the same except that a single check is drawn on the regular bank account and is entered in the check register in order to create the special payroll fund. If employees are paid by cash, a single check payable to the paymaster or to the payroll cash fund is written and is entered in the check register. The cash is inserted in payroll envelopes.

When financial accounting is supplemented by the use of cost accounting, payroll expense accounts must be allocated to various cost units. The basis for the distribution of payrolls to cost units is the analysis of payrolls by the cost accountant. The classifications of payroll costs by divisions and units may appear in a distribution section of the payroll sheets or may be shown in a special analysis sheet of labor costs. Usually the distribution of payroll costs is made in the form of general journal entries. A complete discussion of payroll distribution is given in subsequent chapters in connection with the discussion of each division of the business enterprise.

Accruing Payrolls.—Payrolls generally cover a weekly or bimonthly period, but the accounting period usually closes on the last day of each month or of each quarter. Frequently the monthly accounting period ends at some point in a week rather than at the close of the week. The monthly period may end on Wednesday, but the payroll week may not end until the following Friday evening and the workers may be paid on Saturday. In order that all payroll costs may be charged to the proper accounting period, Monday, Tuesday, and Wednesday must be included as part of the monthly period. A common method of correcting the payroll accounts is to prepare adjusting journal entries for the amount of the unrecognized payroll expense, which results in the creation of one or more accrued liability accounts. The adjusting journal entry for the factory payroll is as follows:

Factory Payroll	xxx	
Accrued Factory Payroll		xxx

The Accrued Factory Payroll account is shown as a current liability in the balance sheet for the period. When the next payroll is vouchered it may be debited in the following way:

Accrued Factory Payroll	xxx	
Factory Payroll	xxx	
Vouchers Payable		xxx

When payment is made the entry is as follows:

Vouchers Payable	xxx
Cash	xxx

Some enterprises use Accrued Payroll accounts as regular expense accounts in order to avoid the necessity of adjusting entries for accrued payrolls. An Accrued Factory Payroll account may be used instead of the Factory Payroll account. Such an account would be credited for the month's total labor cost distributable to plant operations and would be debited for the payrolls vouchered during the month; any credit balance remaining in the account at the end of the month would represent the accrued wages payable. The Accrued Factory Payroll account is shown in the balance sheet as a current liability. The credit balance is automatically offset when the next week's payroll, which includes the amount of the accrued payroll for the preceding period, is vouchered. Accounts such as Accrued Administrative Salaries and Accrued Sales Salaries may be used in a similar manner.

The Federal Social Security Act.—The Federal Social Security Act became a law Aug. 14, 1935, and the important taxing provisions of the act were held constitutional by the United States Supreme Court on May 24, 1937. The act is a legislative attempt to alleviate economic insecurity by providing direct aid in the form of old-age and survivors benefits, to encourage state unemployment compensation for workers and state programs to aid needy adults and children, and to promote public health. The old-age and survivors insurance plan is strictly a Federal program, administered by the Federal government without state sanction or aid. The unemployment compensation plan, the state programs for old-age assistance, aid to dependent children, maternal and child welfare, aid to the blind, and state and local public health service are each administered by individual states with the cooperation and assistance of the Federal government.

There are three social security taxes for which records must be provided. The Federal old-age and survivors insurance tax[1] applies to both employers and employees of business enterprises covered by the act. Provision is made for two distinct taxes collected from the employer as a single payment. An excise tax is levied on all employers and an "income tax" is levied on employees to provide a fund from which insurance benefits may be paid to those individuals or their survivors who qualify under the provisions of the act. The Federal unemployment compensation tax applies only to employers of eight or more employees

[1] The term "old-age and survivors insurance" is used in the Social Security Act Amendments of 1939; the terms "old-age benefit" and "old-age annuity" were used previously.

in covered employments. It is an excise tax levied on employers, the proceeds of which are used to induce states to enact unemployment compensation laws and to collect the funds necessary to pay the cost of administration of state laws. There is no provision for special taxes to finance Federal grants nor to assist states in their grants to needy people.

FEDERAL OLD-AGE AND SURVIVORS INSURANCE TAX

The Federal Social Security Act in a subchapter cited as the Federal Insurance Contributions Act creates a plan of Federal old-age and survivors benefits which may be paid to an individual who attains the age of sixty-five and who qualifies under the provisions of the act or to his wife, children, widow, or parents, who are qualified to receive benefits. The tax on the employer is an excise tax and is applied to employers of one or more employees in covered employments. It applies only to the first $3,000 annual wage paid to each employee from any one employer. The second tax is called an "income tax" but is in no way related to the Federal personal income tax. It is levied upon the first $3,000 of remuneration each employee receives from any one employer. It is deducted by the employer from employees' wages and is payable, together with the amount of the employer's tax, to the Department of Internal Revenue.

The rate of tax is identical for both employees and employers, increasing from 1 until it reaches 3 per cent. A schedule of the old-age and survivors insurance taxes is given below:

Years	Employer's excise tax, per cent	Employee's income tax, per cent	Total tax, per cent
1939–1943	1	1	2
1943–1946	2	2	4
1946–1949	2½	2½	5
1949 and subsequent years	3	3	6

Old-age and survivors insurance taxes are determined on a cash basis. The amount of remuneration actually paid by the employer and received by the employee is the basis for the tax. Thus wages and commissions received during January are considered for tax purposes as January wages.

Wages.—The term wages for the purpose of the old-age and survivors insurance tax is defined as follows:[1]

> The term "wages" means all remuneration for employment, including the cash value of all remuneration paid in any medium other than cash; except that such term shall not include—

[1] For a complete statement see the Social Security Act Amendments of 1939, Sec. 209 (a).

(1) That part of the remuneration which, after remuneration equal to $3000 has been paid to an individual by an employer with respect to employment during any calendar year, is paid to such individual by such employer with respect to employment during such calendar year.
(2) The amount of any payment made to, or on behalf of, an employee under a plan or system established by an employer for his employees on account of retirement, or sickness or accident disability or medical and hospitalization expenses or death, provided the employee has not the option to receive or assign, instead of provision for such death benefit, the funds appropriated by the employer.
(3) The payment by an employer (without deduction from the remuneration of the employee) (*a*) of the old-age and survivors insurance tax imposed upon an employee or (*b*) of any payment required from an employee under a state unemployment compensation law.
(4) Dismissal payments which the employer is not required to make.
(5) Wages paid for services outside of the United States.
(6) Remuneration for services of rail carriers (covered by a separate plan).
(7) Tips and gratuities received by the employee and not accounted for by the employee to the employer.
(8) Special privileges, such as entertainment, restaurants, medical services, and discounts on purchases offered by an employer to his employees.
(9) Reimbursements of business expenses, such as travelling expenses and other expenses incurred in the business of the employer and accounted for by the employee.
(10) Remuneration exempted by Section 209 (b) of the Social Security Act Amendments of 1939 described under "Employment."

Thus the first $3,000 of wages paid to an employee is taxable to both the employer and the employee, regardless of the form of the compensation, while wages in excess of $3,000 are tax exempt to both the employer and the employee. If a person is employed by more than one employer during a year, both the employer and employee are taxed on the first $3,000 received from each employer; consequently it is possible that one individual's earnings may be taxed for an amount in excess of $3,000. However, an individual who has been employed by more than one employer and whose wages exceed $3,000 during any calendar year is entitled to a refund of any amount of tax which exceeds the tax on the first $3,000 wages deducted from his wages and paid to the collector. Employers are not entitled to refunds of taxes paid on earnings in excess of $3,000 received by an individual from two or more employers.

The term "wages" includes remuneration other than cash in such form as goods, food, clothing, and lodging. Wages may be paid daily, weekly, semimonthly, monthly, or on any other basis and may be based upon piecework, sales, profit, or time. The form of payment is immaterial in determining wages, and wages include salaries, bonuses, fees, gifts,

commissions, and insurance premiums and payments by employers to funds of employees when benefits accrue exclusively to employees.

Employment, Employers, and Employees.—Section 209 (b) defines "employment" as any service, of whatever nature, performed within the United States or in connection with an American vessel under a contract entered into within the United States or during the performance of which the vessel touches at a port in the United States if the employee is employed in connection with such vessel when outside the United States, except:[1]

(1) Agricultural labor;
(2) Domestic service in a private home, local college club, or local chapter of a college fraternity or sorority;
(3) Casual labor not in the course of the employer's trade or business;
(4) Service performed by an individual in the employ of his son, daughter, or spouse, and service performed by a child under the age of twenty-one in the employ of his father or mother;
(5) Service on foreign vessels and certain fishing vessels of less than ten tons;
(6) Service performed in the employ of the United States Government or of an instrumentality of the United States;
(7) Service performed in the employ of a state or any political subdivision thereof, or any instrumentality of one or more state or political subdivisions;
(8) Service performed in the employ of a corporation, community chest, fund, or foundation, organized and operated exclusively for religious, charitable, scientific, literary or educational purposes, or for the prevention of cruelty to children or animals, no part of the net earnings of which inures to the benefit of any private shareholder or individual.
(9) Public service, including foreign governments, but with important limitations which now include all banks, building and loan associations and certain other organizations.
(10) Certain services at nominal pay for fraternal and beneficiary associations; for schools and colleges by regular students; and for hospitals by internes and nurses in training.
(11) Services performed by newsboys under the age of eighteen.
(12) If the services performed during one-half or more of any pay period (of not more than thirty-one consecutive days) by an employee for the person employing him are covered, then all the services performed during that period are covered; if less than one-half are covered, none are deemed to be covered.

The act defines an employer as "an individual, a corporation, a partnership, a trust, an estate, a joint-stock company, an association, or a syndicate, group, pool, joint venture, or other unincorporated organization, group or entity which employs one or more persons in non-

[1] *Ibid.*, Sec. 209 (b).

exempt employment." To establish employer and employee status, the legal relation of employer and employee must exist, the nature of the employment must not be exempt, and the work must be performed in the United States.

Every employee, even though he be a minor or an alien, is covered by the act if his occupation is not exempted. Workers, managers, superintendents, officers, and foremen are all classed as employees; directors who are not officers, the partners of a partnership, individual entrepreneurs, and self-employed persons are excluded.

The relationship of employer and employee is established by the fact that the work of the employee is under the control and direction of the one who pays his wages. An employee must be subject to the will and control of the employer, not only as to *what* shall be done but also as to *how* it shall be done. The employer need not exercise such control, but the right to do so must exist. If one is subject to the control or direction of another merely as to the *results* to be accomplished and not as to the *means* and *methods* of accomplishing the result, he is not an employee but an independent contractor and, as such, is not subject to the tax. However, the independent contractor may be an employer himself if he hires others to aid him. Independent contractors, including physicians, dentists, public accountants, lawyers, contractors, subcontractors, architects, and others who perform professional services to the public, are not classified as employees and are not subject to tax under the act.

FEDERAL UNEMPLOYMENT COMPENSATION TAX

One section of the act, commonly called the "Federal unemployment compensation law," was passed to induce the various states to enact their own compensation laws. In order to accomplish this purpose the Federal law levies an excise tax on all employers of eight or more employees, bases the tax on the payroll, excluding amounts in excess of $3,000 paid to any employee, and allows a deduction from the Federal tax of credits under merit rating provisions and all unemployment compensation taxes paid to states having laws approved by the Social Security Board, but such deduction may not exceed 90 per cent of the Federal tax. The 10 per cent of the Federal tax is used to pay the cost of the administration of state laws.

All states and territories have passed unemployment compensation laws which have met the requirements of the Federal law and the approval of the Social Security Board. Should a state fail to have a satisfactory unemployment compensation law, its employers would be forced to pay a Federal tax, but employees in the state would not be eligible for benefits. The state laws and methods of administration are subject to review and approval by the Social Security Board, and the board may disallow

deductions and administrative cost. The board certifies to the Secretary of the Treasury the amounts required by each state for the proper administration of its unemployment compensation law. The basis of the allocation is the population of the state, an estimate of the number of persons covered by the law, an estimate of the cost of the proper administration of the law, and any other factors considered of significance by the board.

The Federal unemployment compensation tax is an excise tax on employers of eight or more employees. Employees are not taxed. The tax rate was set at 1 per cent for 1936, 2 per cent for 1937, and 3 per cent for 1938 and thereafter. The cash basis of accounting is followed.

The meaning of the term "wages" is identical for both the old-age and survivors insurance and the unemployment compensation provisions of the act which are given on page 103 of this text.

The term "employment" is defined for purposes of the unemployment compensation tax in an identical manner as for the old-age and survivors insurance tax; likewise, the list of exceptions provided for are substantially the same for both.[1] The unemployment compensation provisions do, however, exclude insurance agents paid wholly on a commission basis while the old-age and survivors insurance provisions do not make such exclusion.

Article 204, Sec. 907, of the act restricts the term "employer" to apply to any person who employs eight or more individuals (in an employment subject to tax) on a total of 20 or more calendar days during a calendar year, each such day being in a different calendar week.

The several weeks in each of which occurs a day on which eight or more individuals are employed need not be consecutive weeks. It is not necessary that the individuals so employed be the same individuals; they may be different individuals on each such calendar day. Neither is it necessary that eight or more individuals be employed at the same moment of time or for any particular length of time or on any particular basis of compensation. It is sufficient if the total number of individuals employed during the 24 hours of a calendar day is eight or more, regardless of the period of service during that day or the basis of compensation.

If an employer has three different business establishments in each of which there are three employees, he is deemed to have nine employees, provided that all the enterprises are nonexempt business undertakings. The number of employees includes both permanent and part-time workers in the course of an employer's business.

The term "employer" is defined in Art. 205 as "an individual, a corporation, a partnership, a trust or estate, a joint stock company, an

[1] See p. 105 of this text for list of exceptions to "employment" under the old-age and survivors insurance provisions.

association, or a syndicate, group, pool, joint venture, or other unincorporated organization, group or entity." Likewise, an employer may be an individual acting in a fiduciary capacity.

The conditions underlying the relationship of employer and employee are the same in the unemployment compensation provisions of the act as were described for the old-age and survivors insurance provisions.

STATE UNEMPLOYMENT COMPENSATION LAWS

The Federal government makes grants to states for the administration of their compensation laws and acts as custodian for state unemployment funds. An Unemployment Trust Fund, into which is deposited all money collected by various states, is maintained as a part of the Treasury of the United States. The investment of the fund is an obligation of the Secretary of the Treasury, but there is a restriction by law that only obligations of the United States or obligations guaranteed as to both principal and interest can be purchased with money from the fund. The sums deposited by each state are accounted for separately, and a proportionate share of the earnings on total funds invested are credited to the account of each state at the close of each quarter. Sums are disbursed to states as they are required for unemployment compensation benefits.

Since there are 51 separate state and territorial unemployment compensation laws, each with its own peculiarities and special features, it is impossible to describe the features of each law in this book. A careful study of the regulations covering the laws of each state should be made for particular states. Some of the significant tax provisions common to all states are discussed briefly in the following section.

State Unemployment Compensation Taxes.—All state unemployment compensation laws provide for the levy of a tax on the employer based upon the wages paid to employees. At the present time only a few states tax the employee also; in such states employee taxes are collected and paid by employers together with their own unemployment tax assessments. The employer is liable for the payment of his own tax and for the collection and payment of the employee tax.

Since 1938 the Federal unemployment compensation tax has been 3 per cent of the wages paid to employees. The employer may credit his contributions to state employment funds against this Federal tax, equal to, but not in excess of, 90 per cent of the Federal tax; therefore most state laws provide for a tax levy on employers of 2.7 per cent, which amounts to 90 per cent of the Federal tax. For example, if the taxable payroll of the X Co. is $10,000, the Federal tax of 3 per cent assessed on the employer would be $300. If the state tax is 2.7 per cent of wages paid, the amount of the state tax payable by X Co. would be

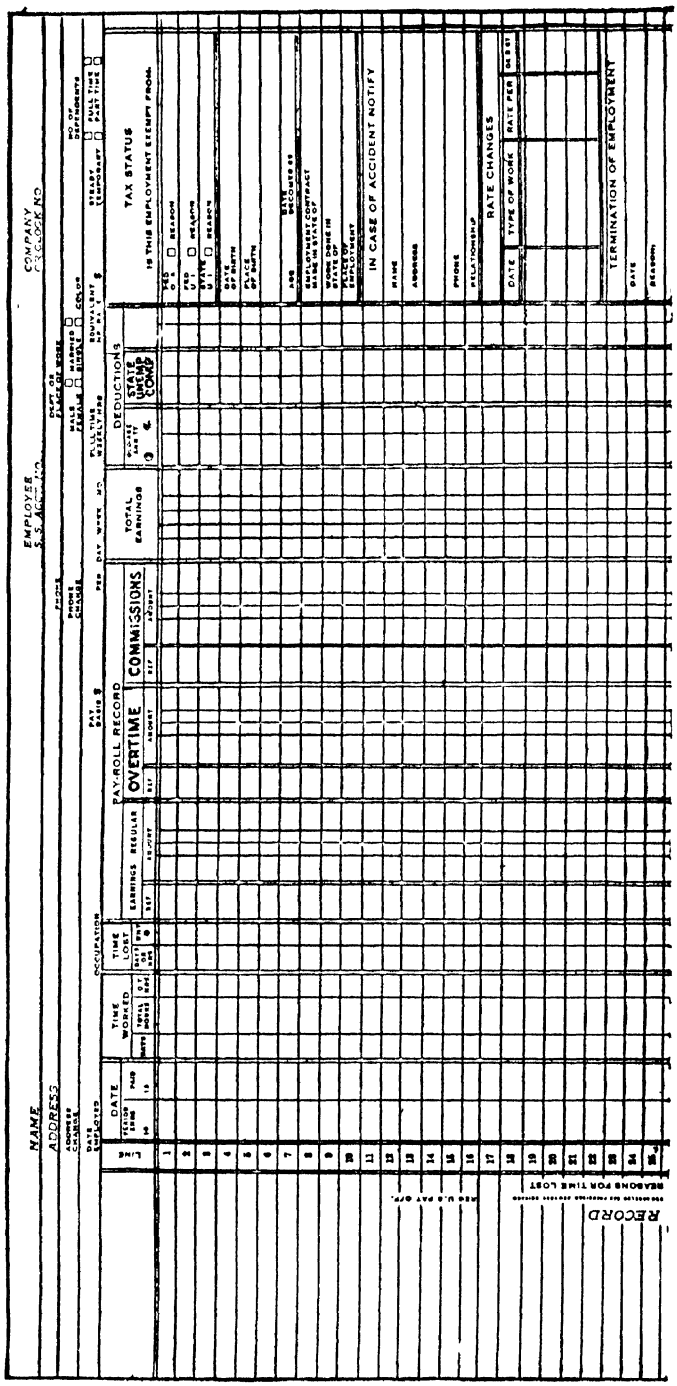
$270, exactly 90 per cent of the 3 per cent Federal tax of $300, and the amount of tax payable to the Federal government would be $30.

Merit Ratings.—The merit-rating provisions of the unemployment compensation laws of various states are of special interest to managers, personnel directors, and accountants. Under the merit-rating plans now in use in most states, there is maintained for each employer a separate account to show as credits all the payments made by the employer and as debits all payments of benefits made to his employees. Employers with favorable employment records are taxed at a lower rate. Thus when the balance in an employer's account reaches a stated percentage of his annual payroll, usually about 7 per cent, the tax upon the employer is reduced; the reductions become greater as the balances become larger. Not only do the provisions reward an employer for maintaining a stable employment record by allowing him a substantial saving, but they also impose penalties on the employer who fails to do so. The special conditions which must be obtained in order to qualify an employer for the lower rates vary greatly from state to state, and particular state laws should be studied carefully.

Stabilization of employment is an essential function of good management. Employees are vitally interested in stabilizing employment, for unemployment compensation is not a substitute for employment. The benefits paid the unemployed man constitute only a small portion of his working wage and can do little but alleviate the suffering incident to unemployment.

The fact that the reduction of labor turnover is desired by both management and employees does not make the goal easy of achievement. Stabilization of employment can be brought about only by careful planning and budgeting of production. Irregular and seasonal production and employment must be minimized. A careful analysis of marketing conditions and of the type of product may make it possible to build up inventories during slack periods. Available work may be spread among employees already on the payroll rather than discharging some of them and hiring others. By exercising care in employing and training, workers may be shifted from one department to another as need demands. It may be that in some cases plant equipment and personnel can be used in making another product during the slack seasons. All possible solutions to the problem need to be examined.

An efficient accounting department is essential to the stabilization of employment. The formulation of labor policies, the planning of production, and the effective utilization of the working force will depend in no small measure upon the ready availability of adequate records containing information necessary to departments and executives.


NAME
ADDRESS
EMPLOYER
COMPANY
PAY-ROLL RECORD
OVERTIME
COMMISSIONS
DEDUCTIONS
TAX STATUS
IN CASE OF ACCIDENT NOTIFY
RATE CHANGES
TERMINATION OF EMPLOYMENT
RECORD

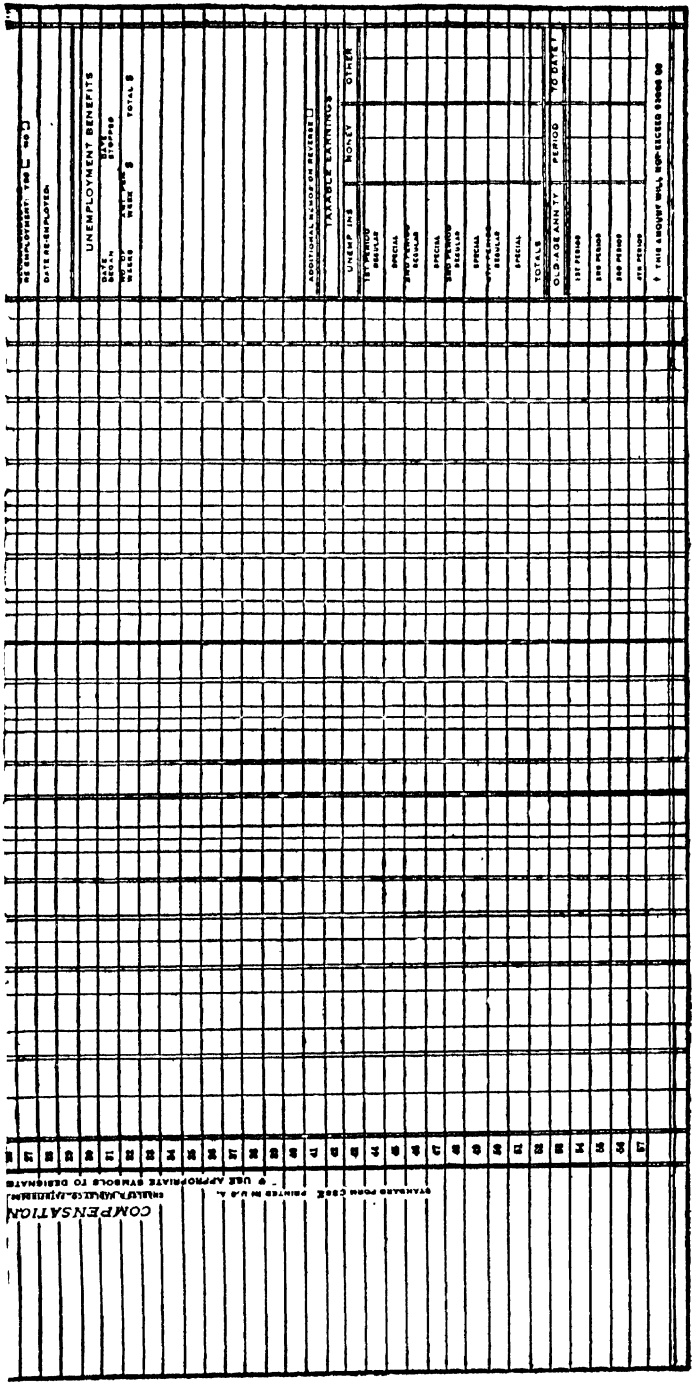


Exhibit 23.—Individual employee compensation record.

PERSONNEL AND PAYROLL RECORDS

Personnel, payroll, and labor distribution records should meet the requirements of cost accounting as well as those of financial accounting and should provide information required by various provisions of the social security program. The social security laws specify the various data which must be kept, but they do not specify what forms should be used. Each employer is permitted to maintain the type of records best suited to his own purposes and is allowed some flexibility in building a payroll system.

Section 1403 of the Social Security Act Amendments of 1939 provides that every employer shall furnish to each of his employees a written statement showing the wages paid by him to the employee. Each statement shall show the name of the employer, the name of the employee, the period covered by the statement, the total wages paid, and the amount of the tax imposed. Since the regulations do not specify the form of receipt that shall be used, various methods are employed in reporting, such as a separate slip or statement, a notation on the payroll check, and a notation on the payroll envelope.

Regulations 91, Art. 412, relating to Title VIII of the old-age and survivor insurance provisions of the Social Security Act, specify that every employer liable for the tax shall keep accurate records of all remuneration paid to his employees for services performed and that his records shall show in respect to each employee:

(1) The name and address of the employee and the account number assigned to the employee under the Act;
(2) The occupation of the employee;
(3) The total amount (including any sum withheld therefrom as tax or for any other reason) and date of each remuneration payment and the period of services covered by such payment;
(4) The amount of such remuneration payment which constitutes wages subject to tax; and
(5) The amount of employees' tax withheld or collected with respect to such payment; and, if collected at a time other than the time such payment was made, the date collected.

In order to provide the information required for reports and tax returns, some sort of individual compensation record should be kept. A form of compensation record is illustrated as Exhibit 23. Such a record not only provides management with individual employee data required by various Federal and state regulations in preparing quarterly and annual reports but also supplies a complete record which is valuable for managerial control of personnel and payrolls.

The information used for posting to the compensation record is obtained from the payroll record, the content of which is partly determined by the requirements of the compensation records. The original data for the payroll are obtained from the time cards which show the hours worked or from piecework records which show the number of pieces finished, the rate, and the time worked.

The payroll itself is merely a columnar record which lists the employees and gives other pertinent information. Employees may be listed in alphabetical order on one sheet; they may be grouped by function; or, where the firm is large, a separate payroll may be prepared for each department. The number of columns to be used is determined by the information to be shown. Usually columns appear for employee's name; number; department; time worked, which may be given in total or detailed by days; rate of pay; total salary or wages; other compensation, showing kind and amount; earnings exempt from social security taxes; payroll deduction for each social security tax; company deductions; and the net amount to be paid the employee.

Regulation 90, Art. 307, relating to Title IX of the unemployment compensation provisions of the Social Security Act, provides that the permanent records kept by each employer contain:

(1) The total amount of remuneration payable to his employees in cash or in a medium other than cash, showing separately
   (a) total remuneration payable with respect to services excepted,
   (b) total remuneration payable with respect to services performed outside of the United States,
   (c) total remuneration payable with respect to all other services.
(2) The amount of contributions paid by him into any State unemployment fund, with respect to services during the calendar year not excepted, showing separately
   (a) payments made and not deducted (or to be deducted) from the remuneration of employees,
   (b) payments made and deducted (or to be deducted) from the remuneration of employees; and also the amount of contributions paid by him into any State unemployment fund with respect to services excepted.
(3) The information required to be shown on the prescribed (tax) return and the extent to which such person is liable for the tax.

There are many different forms of payroll sheets which meet these requirements. Exhibits 24 and 25 are illustrations of a payroll sheet which contains a record of daily time and shows a distribution of payroll by departments.

Accounts for Social Security Tax Transactions.—The general ledger accounts used for the purpose of recording transactions in connection with the collection and payment of social security taxes differ with the indi-

NO. PAY ROLL PERIOD ENDING 19

*USE APPROPRIATE SYMBOLS TO DESIGNATE REASONS FOR EXEMPTION

NAME	EMPLOYEE NO.	DEPT. OR WORK	DATES	TOTAL TIME DAYS	TOTAL TIME HRS.	RATE	PER	SALARY OR WAGES	OTHER COMPENSATION KIND	OTHER COMPENSATION AMOUNT	TOTAL EARNINGS	TAX EXEMPT EARNINGS FEDERAL OLD-AGE ANNUITY	SYMBOL*	TAX EXEMPT EARNINGS FEDERAL UNEMP. INS	SYMBOL*	TAX EXEMPT EARNINGS STATE UNEMP. INS	SYMBOL*
AMOUNTS FORWARDED																	

Exhibit 24.—Payroll record (left side).

PAY ROLL PERIOD ENDING 19 NO.

PAY-ROLL DEDUCTIONS FEDERAL OLD-AGE AND TV TAX				PAID NET AMOUNT	PAID CHECK NO.	DEPT. A	DEPT. B	DEPT. C	DEPT. D								

Exhibit 25.—Payroll record (right side).

vidual business enterprise and are determined by the methods of accounting employed. Two groups of accounts are required: an expense account for each type of tax to be paid by the employer, and a liability account for each class of taxes payable by the employer to the Federal and to state governments.

In order that complete social security tax information may be available to management, it is suggested that the following accounts be carried in the general ledger:

Expense accounts:
- Old-age and Survivors Insurance Tax
- Federal Unemployment Compensation Tax
- State Unemployment Compensation Tax

Liability accounts:
- Accrued Employees' Old-age and Survivors Insurance Tax
- Accrued Employees' State Unemployment Compensation Tax
- Accrued Employer's Old-age and Survivors Insurance Tax
- Accrued Federal Unemployment Compensation Tax
- Accrued Employer's State Unemployment Compensation Tax

The expense accounts represent operating expenses of the business enterprise. The first two liability accounts show tax deductions from employees' wages which are payable by the business enterprise to the Federal and to state governments. The last three liability accounts represent the obligation of the business enterprise to the Federal and state governments for unpaid social security taxes which have been recognized as business expenses. If taxes are payable to more than one state, the liability to each state should be shown separately.

In place of a separate tax account for each type of tax expense, it may be convenient to use a single general ledger account termed Social Security Taxes, and to delegate the various Federal and state taxes to subsidiary ledger status. Similarly, two liability accounts may be used: one account, such as Accrued Employees' Social Security Taxes, may be employed to show the liability for the payroll deductions made by the employer; and a second account, termed Accrued Social Security Taxes, may be used to show the employer's liability. For informational purposes there is a distinct advantage in exhibiting separate tax expense and liability accounts in the general ledger and in the balance sheet and profit and loss statement; consequently the use of consolidated expense and liability accounts is not recommended.

It is generally advisable to record the tax liability in connection with each weekly or bimonthly payroll at the end of each payroll period.

Accounting Entries.—In order to illustrate the entries required to record payroll and social security taxes, the following conditions are assumed:

Payroll Summary for Week Ending, Jan. 12, 19—		
Factory payroll	$10,000	
Executive salaries	5,000	
Sales salaries	3,000	
Sales commissions	2,000	
Total payroll before deductions		$20,000
Deductions:		
Employee old-age and survivors insurance tax	200	
(Assume employee old-age and survivors insurance tax of 1%)		
Employee state unemployment compensation tax	200	
(Assume employee state unemployment compensation tax of 1%)		
Total deductions		400
Net amount to be paid		$19,600

Statement of Employer's Payroll Taxes for Week Ending Jan. 12, 19—	
Old-age and survivors insurance tax	$200
(Rate of 1% of $20,000 payroll)	
Federal unemployment compensation tax	60
(3% of $20,000 or $600 less the credit for the employer's state tax of 90% of $600 or $540.)	
State unemployment compensation tax	540
(Assume rate of 2.7% of $20,000)	
Total employer's payroll taxes	$800

When the payroll for the week is vouchered, it is entered in the voucher register as follows:

Factory Payroll	$10,000	
Executive Salaries	5,000	
Sales Salaries	3,000	
Sales Commissions	2,000	
Vouchers Payable		$19,600
Accrued Employees' Old-age and Survivors Insurance Tax		200
Accrued Employees' State Unemployment Compensation Tax		200

In the check register the following entry is required to record the payment of the payroll by checks or by cash:

Vouchers Payable	$19,600	
Cash (or Bank)		$19,600

The following journal entry may be made to record the employer's payroll taxes for the week and to recognize the corresponding liabilities incurred:

Old-age and Survivors Insurance Tax	$200	
Federal Unemployment Compensation Tax	60	
State Unemployment Compensation Tax	540	
Accrued Employer's Old-age and Survivors Insurance Tax		$200
Accrued Federal Unemployment Compensation Tax		60
Accrued Employer's State Unemployment Compensation Tax		540

When vouchers are prepared and payments of Federal and state social security taxes are made, each accrued tax liability account is debited and Vouchers Payable is credited in the voucher register, followed by an entry in the check register debiting Vouchers Payable and crediting Cash or Bank.

Distribution of Payroll Taxes to Cost Units.—In enterprises in which only a financial accounting system exists, the expense accounts for the old-age and survivors insurance tax, the Federal unemployment compensation tax, and the state unemployment compensation taxes are closed into the Profit and Loss account at the end of each period. When a cost accounting system is employed, it is essential in obtaining accurate costs to apportion the payroll-tax expense accounts to existing cost units or factors upon equitable distribution bases.

In manufacturing concerns employer's payroll taxes may be considered as indirect expenses and charged first to Factory Overhead Expense and then allocated to service and production departments. In sales organizations a share may be assigned to each sales service department and sales territory. The basis of the expense distribution is generally the proportionate amount of wages and salaries earned by employees in each division.

Some accountants recommend the practice of charging payroll taxes directly to appropriate wages and salaries accounts, but such a procedure is not advisable when cost methods require that labor costs be charged to production orders. Such a practice would require adjustment of workers' daily time cards from which charges may be made directly to production orders.

Questions

1. What should be the important objectives of payroll records and payroll accounting?

2. What payroll accounts are commonly used in recording payroll expense elements? What types of subsidiary records do such general ledger accounts control?

3. What entry is made to record the payroll summary of a manufacturing concern? What entry is made when the payroll is disbursed by checks? In the form of cash? What special journals are used to record each entry?

4. Explain what is meant by the accrual of payrolls. What entry is made at the close of each accounting period to recognize payroll expense which is accrued and unpaid? How is the liability account for accrued payroll treated in the balance sheet prepared at the end of the accounting period? How is the account closed during the next accounting period?

5. What treatment is afforded the recording of regular weekly payrolls, the payment of payrolls, and the accrual of labor costs due and unpaid at the end of the accounting period when an Accrued Payroll account is used?

6. Describe briefly the main provisions of the Federal Social Security Act. What are the principal objectives of the act? What body is responsible for its administration?

7. Give the important tax provisions dealing with old-age and survivors insurance. What is the nature of each of the two taxes collected from the employer as a single payment?

8. Explain the meaning of the term "wages" as defined for purposes of the old-age and survivors insurance tax. What forms of remuneration are exempt?

9. Discuss briefly the meaning of the terms employment, employers, and employees as defined in connection with the old-age and survivors insurance tax.

10. Describe the important taxing provisions of the Federal unemployment compensation law. What objective was expected to be accomplished by this section of the Social Security Act? Has that objective been accomplished?

11. In connection with the Federal unemployment compensation law, explain the meaning of each of the following terms: "wages," "employment," "employers," and "employees."

12. Why are there state unemployment compensation laws in addition to the Federal unemployment compensation provisions of the Federal Social Security Act? Are the state laws uniform in their coverage and tax rates? Explain.

13. Explain what is meant by the merit-rating provisions of the unemployment compensation laws of various states. Of what interest are they to managers and accountants of business enterprises?

14. What personnel and payroll records are necessary to meet the requirements of the social security program and of managers of business enterprises? Describe each record briefly.

15. What expense accounts are necessary to record social security tax transactions? What liability accounts would you recommend for use by the accountant? In general, how should payroll-tax expenses be distributed to cost units such as departments, processes, and sales territories?

Problem 1

In the year 1942, James Simpson was employed from Jan. 1 until July 1, by the X Manufacturing Co. at a salary of $400 per month; in addition he received during the period $50 a month for traveling expenses. From July 1 until Nov. 30, Simpson was employed by the Y Wholesale Co. on a straight commission basis; during his employ his commissions totaled $2,000. On Dec. 1, he obtained a position in the state income tax department at a salary of $200 per month.

a. Compute the old-age and survivors insurance taxes payable on Simpson's remuneration during 1942 from each employer. What deductions should be made from Simpson's remuneration by each employer?

b. What is the liability of each employer to the Federal government and to the state on Simpson's taxable earnings for state unemployment compensation taxes?

Problem 2

During 1942, Robert Hurd worked for three employers. The total amount received from each employer, classified by type of remuneration, is as follows:

	Employer A	Employer B	Employer C
Salary	$ 600	$1,500	$1,000
Commissions	400	150	
Traveling expenses	200		
Rent of office			300
Allowance for entertaining customers		50	
Total	$1,200	$1,700	$1,300

a. What are Hurd's total taxable earnings for 1942 for purposes of the old-age and survivors insurance tax?

b. Prepare a schedule showing the tax liability of each employer, the amount of tax borne by each employer, and the payroll deductions made from Hurd's remuneration in accordance with both the old-age and survivors insurance and unemployment compensation tax provisions.

Problem 3

Emily Lanter, a waitress in the Big Circle Cafe, was employed during 1942 for 300 days at a wage of $1 per day. In addition she received two meals free of charge each working day; tips which she retained personally amounted to $200; and she received an extra bonus during the Christmas holidays of $20. At the end of the taxable year, her employer still owes her $30 in wages.

a. Assuming that 30¢ is considered a reasonable amount for each meal given to employees, compute the taxable income of Emily Lanter.

b. Compute the old-age and survivors insurance tax and unemployment compensation tax.

Problem 4

Specify in each of the following cases whether the individual's remuneration is taxable for purposes of (*a*) the old-age and survivors insurance tax and (*b*) the unemployment compensation tax, giving an explanation in each case:

(1) Henry Thomas, a salesman for the National Machine Co. of New York, is paid a commission of 25% of all sales made in his territory, which consists of the state of Texas and the northern half of Mexico.

(2) Robert McMorran, a college student, spent the summer months harvesting wheat for one farmer, digging potatoes for a second farmer, and clerking in a grocery store the balance of the summer; during the school year he earns his board as a waiter in a fraternity house.

(3) Harold Johnson, a proprietor of a grocery store, employs his son, age 22, and his daughter, age 17, Friday and Saturday of each week. Assume (*a*) that he pays each a regular salary; (*b*) no salary or wage is paid.

(4) Peter Schmaltz, a citizen of Holland, is employed as a technical expert in a large machine shop in Philadelphia; his salary is $5,000 a year.

(5) Arnold Tappan is a public accountant who conducts his private practice with the aid of one junior accountant and a stenographer.

(6) Sally Jones is a nurse employed at General Hospital maintained by Kansas City, Mo.

(7) Dr. White is employed on a part-time basis as city health officer; he also conducts a private practice.

(8) Ezra Hawkins is on the county relief rolls and also earns additional amounts by odd jobs of painting, mowing lawns, and gardening.

(9) James Dutch is secretary of the local Y.M.C.A.

(10) J. A. Kistler is a professor of economics in a college which is supported by the Methodist Church.

Problem 5

The Fulton Manufacturing Co. is uncertain concerning the social security tax requirements regarding the compensation of each of the following:

1. The president of the concern who receives a salary.

2. The foreign salesmanager who is located in New York but whose compensation consists of commissions on sales of products in Europe.

3. The credit manager who is 67 years of age.

4. The members of the board of directors who receive $25 each for every day or part of a day spent in attending directors' meetings.

5. The office boy who is 17 years of age.

Advise the company as to the tax requirements for each case enumerated above.

Problem 6

For a 3-month period during 1942, the Reliable Produce Co. had five regular employees as follows:

Name	Classification	Total Compensation
Frank Hardy	Warehouseman	$240
Bill Rhodes	Warehouse helper	150
Ruth Cowie	Stenographer	180
Phillip Rost	Salesman	300
Bruce Nelson	Truck driver	330

The truck driver owns his truck; he personally pays the cost of repairs and upkeep with the exception of gasoline, which is furnished by the company. The wage rate for truck drivers who do not furnish their trucks is $60 per month.

During the 3-month period two painters were employed for 10 days each and two carpenters for 21 days each (at the rate of $4 a day for painters and $5 a day for carpenters) to paint and remodel the warehouse. Each Saturday during the year a high-school boy is employed at the rate of $2 per day to help in the office.

Prepare a schedule of taxes to be paid and payroll deductions to be made by the company.

Problem 7

The Nichols Electric Co. prepares and pays its payroll weekly. The payroll for the week ending Jan. 19, 1942, is as follows:

Administrative salaries	$ 3,000
Executive salaries	2,000
Sales salaries	4,000
Sales commissions	2,500
Factory wages	6,500
Total payroll before deductions	$18,000

a. Prepare a statement showing the employer's social security payroll taxes and the payroll deductions to be made by the employer from employees' earnings. (Assume state unemployment compensation tax is 1 per cent for employees.)

b. Give entries to voucher the payroll for the week, to recognize the employer's taxes, and to record the cash payment of the payroll.

Problem 8

The following information, taken from daily time tickets, summarizes the time and piecework for the week ending Dec. 8 for the Dickey Co.:

Employee	Identification No.	Production order No.	Hours worked	Production pieces	Hourly rate	Piece-rate
Adams, R. M.	510	1015	40		$0.80	
Armstrong, T.	511	1019	38		0.75	
Baty, P. A.	512	1105		1,500		$0.02
Dickens, S. W.	516	1105		900		0.05
Harvey, A. R.	518	1119	35		0.80	
Thomas, D. S.	530	1120	45		0.60	
Wiley, J. E.	541	1149		40		1.00

The company operates on a 40-hour week and pays time and one-half for overtime.

a. Prepare a payroll for the week, showing complete information concerning each employee. Additional information is as follows:

(1) An old-age and survivors insurance tax deduction should be made for each employee.

(2) A deduction of $4 is to be made from the wages of P. A. Baty for defective work.

(3) An advance of $10 was made to R. M. Adams on Dec. 5.

(4) A 2% deduction is to be made from each employee's wage for the company's employee health and sickness benefit plan.

b. Prepare journal entries to voucher the payroll, pay the payroll, and recognize the company's payroll taxes and tax liabilities.

Problem 9

The time and piecework cards for machine operators in Dept. X of the Melton Machine Shop show the following information for the week ending, Friday, Aug. 11:

Date	Workmen								
	A	B	C	D		E		F	
	Hours	Hours	Hours	Units	Hours	Units	Hours	Units	Hours
Aug. 5 (Sun.) 6	8	6	9	100	8	150	8	90	8
7	7	7	5	125	8	110	8	105	8
8	8	8	4	90	7	100	8	80	7
9	8	6		105	8	95	7	85	8
10		5	9	100	8	120	8	70	8
11	9	8	5	130	8	140	8	75	8

Workmen A, B, and C are paid 60¢ per hour for an 8-hr. day with time and one-half for overtime and double-time for holidays. Workmen D, E, and F are paid in accordance with the Taylor differential piece-rate wage plan. The rate is 5¢ per unit for a standard production of 100 units per 8-hr. day; the rate per piece for workers who surpass the standard is 6¢.

A deduction of 2% for the company's employee group-insurance plan is made each week from the wages of each employee.

Required:

a. Weekly payroll sheet showing wages and deductions for each workman.

b. Journal entries to voucher the payroll, to pay the payroll, and to set up the payroll taxes and tax liabilities of the company.

CHAPTER VII

OVERHEAD COSTS

Definition of Overhead Costs.—Overhead costs are operating costs of a business enterprise which cannot be traced directly to a particular unit of the business. The term "overhead" is used interchangeably with such terms as "burden," "supplementary costs," "manufacturing expense," and "indirect expense." The word overhead is preferred to burden and supplementary costs because the latter terms signify an unnecessary charge, an extra cost, or an element of cost resulting from inefficiency. The terms have been inherited from the handicraft stage of production in which the elements of material and labor were of primary importance and the use of capital in the form of machinery and plant was insignificant. The term overhead is preferred to manufacturing expense, because the latter term is often applied to all manufacturing costs, both direct and indirect. Overhead may be used for all types of business enterprise while the term manufacturing expense is restricted in its use to manufacturing concerns. Indirect expense is an expression which infers that certain costs are invisible or unaccountable. Since the meaning of the term overhead is commonly understood, it is used exclusively in this book.

Overhead costs are subdivided into variable and fixed charges. Variable costs are items such as supplies, power, repairs, and indirect labor which tend to fluctuate as business activity is increased or decreased. Fixed costs include depreciation, taxes, rent, management salaries, heat, and insurance, which tend to remain constant regardless of normal increases or decreases in the volume of business activity. The division of overhead into variable and fixed costs is an important one because it centers the attention of management on those items which can be controlled and encourages increasing the volume of business so that, by spreading fixed overhead charges over a larger production, the overhead cost per unit can be reduced.

The three distinguishable types of overhead are factory overhead, distribution or selling overhead, and administrative overhead. Factory overhead includes all indirect costs incurred by the manufacturing division from the receipt of raw materials until the product is finished and placed in a salable state. Selling or distribution overhead comprises all indirect costs incurred from the time the goods are in a salable state until

they are sold and delivered. Administrative overhead includes all indirect costs incurred in formulating, directing, and controlling general company policies and programs for the operation of the manufacturing and selling divisions of the enterprise.

Control of Overhead Costs.—When overhead costs are properly classified, management is given the opportunity to scrutinize them in detail and to eliminate or to decrease outlays which are not essential to efficient operation. It is a widely recognized maxim that it is easier to increase overhead costs than it is to decrease them. When an extra employee is added to aid in clerical work during a peak period, the work is so adjusted that it is difficult to rearrange the work so that his services are no longer needed. Any business subject to seasonal conditions is forced to increase and to decrease its supervisory, clerical, and other classes of indirect workers to meet changes in demand. Frequently there is a lag between the increasing need for additional help and the acquiring of additional help; there is more commonly a lag between the decline in indirect work to be performed and the decrease in personnel.

Management's struggle to decrease overhead costs is carried to other types of costs such as supplies, light and power, telephone and telegraph, travel, donations, memberships, and forms of advertising. Employees may use supplies in wasteful quantities and demand expensive kinds when less expensive forms would serve the purpose; lights may be used when not required; machines may be left running when not in use; telephone and telegraph service may be used when mail service would be as effective; travel may become exorbitant; and expenditures for donations, memberships, and advertising may be excessive. Even among fixed overhead costs such as rentals and depreciation, frequently management can make readjustments that result in savings. When rentals are high, new leases can be secured; depreciation of fixed assets can be reduced through efficient purchasing and repair policies.

Cost accounting records should exhibit overhead costs by type and by departments, the latter classification usually coming as a rearrangement of costs by type. Thus cost accounts are maintained to show the total amount of each class of overhead such as indirect labor, supplies, taxes, depreciation, insurance, and rent. From these accounts each cost is classified by departments. A careful study of overhead by type and departments made monthly by the comptroller and other officials should result in the curtailment of unnecessary costs and in the maintenance of overhead costs at a subsistence level.

Managerial Problems in Dealing with Overhead Costs.—Cost accounting has reached a stage of development which enables it to supply management with detailed statistical information regarding production costs and prices of products. Timely and intelligent use of such

information may make it possible for management to effect adjustments which result in increased efficiency and, consequently, in larger net profits. Internal conditions within an individual concern and external conditions in the industry or in national markets may prevent the realization of most efficient production and maximum profits, but, through the proper understanding of overhead costs, it is possible for the management to work more intelligently toward that goal.

Among the problems of overhead costs with which management must deal are the following:

a. Decreasing cost conditions—idle capacity.
b. Variety of products.
c. Extension of territories.
d. Price discrimination.
e. Size of the business unit—contraction and expansion policies.

a. Decreasing Cost Conditions—Idle Capacity.—The vast majority of business concerns are subject to decreasing cost conditions up to the point where production reaches the maximum capacity of the plant and equipment. This economic condition is true largely because of the fact that fixed overhead costs do not increase appreciably with an increase in the number of units produced. The cost per unit of product decreases as the quantity of production increases, since there is a decrease in the share of overhead costs chargeable to each unit produced.

The goal of every manager is to operate his business at a constant rate and at a level of production which approximates full plant capacity, but such an ideal situation is seldom approached. Idle capacity, the thing most feared by all businessmen, is a condition applicable to all types of business and may be reflected in higher prices paid by consumers or, as an exaggerated condition peculiar to certain types of businesses, may be borne by producers in the form of high costs and smaller profits. Idle capacity results from four forms of business disease: lack of planning or poor scheduling of work; overexpansion of industries and individual concerns within an industry; seasonal conditions; and irregularities of the business cycle. While losses attributable to idle capacity cannot be eliminated entirely, they can be minimized through the analysis of situations in individual plants. If the concern is carefully departmentalized, cost accounting records can be prepared to reflect the cause and to determine the official or department responsible for the inefficiency. The cost department can prepare special reports showing the hours of idle time for each department and the amount of overhead applicable thereto. Idle machines and equipment can be reported for each department, with a notation of causes such as improper scheduling of work, lack of material, machine breakdown, overexpansion of plant or lack of sales, seasonal conditions, and the business cycle.

If the analysis of idle-capacity conditions discloses that an important cause is lack of planning or poor scheduling of work, lack of materials or machine breakdown, management can fix responsibility and take steps to change the existing situation. If it is discovered that overexpansion of plant or lack of sales is a cause, it may be necessary to inaugurate new selling policies such as lower prices, additional advertising, development of new territories, or production of new lines of products. Seasonal conditions prove more difficult of solution. Some manufacturing concerns have found it possible to produce the same quantity of their finished products each month of the year by storing the production in warehouses during slack seasons of sales and depleting the stock in the peak sales months. Types of concerns, such as retail furniture stores, have special sales during July and August. Beauty parlors, restaurants, and theaters offer special services such as air conditioning or summer rates. The ideal situation is to have such a varied line of production or merchandise that some items are in season at all times of the year.

Idle capacity, which is a part of the irregularities accruing from the business cycle, is the most difficult problem of management. The sudden changes in demand due to financial crises are unpredictable. Since nearly all industries suffer alike, the maintenance of adequate financial reserves; insistence upon strict economy in labor, materials, and overhead costs; and an effort to obtain new business are the only precautions available to the management of an individual concern.

b. **Variety of Products, Extension of Territories, Price Discrimination.**—In an endeavor to absorb overhead costs, management may resort to a number of business practices, *viz.*, a variety of products, extension of trade territories, and differential prices.

It is noticeable that business concerns constantly attempt to increase the number of lines of products that are offered for sale. Drugstores have extended their operations until they are in reality department stores, with a variety of departments varying from hardware to restaurant service. Packing plants have extended their service to include butter, eggs, canned vegetables and meats, and numerous by-products of slaughtering operations. Thus management may add new lines of products for the purpose of spreading fixed overhead costs over a larger number of units, which may result in increasing profits from existing lines even though profits are not realized on new classes of products. It is advantageous to produce any new line of product which will earn an income sufficient to cover its direct costs, variable overhead costs, and a portion of the fixed overhead costs of the concern.

Another means of spreading overhead costs over a greater volume of units sold is to widen the sales area. Salesmen's activities and direct-mail operations can be carried into new states, to new classes of buyers,

and even to foreign markets. Local companies may attempt to extend their trade territories to the entire state, then to neighboring states and national markets through the media of salesmen, mail, or radio. Within a given territory, by varying sales methods and sales appeals, it is possible to broaden the consumer aggregation to include various classes of income groups. The competition among producers for foreign markets has been due largely to the desire to obtain a greater volume of sales and to reap the gain made possible by a decreasing cost per unit of production. Thus automobile concerns, manufacturers of office appliances, producers of rubber goods, packers of food products, and numerous other types of manufacturers have invaded foreign markets in spite of heavy tariff duties.

Probably the most effective method of extending business operations yet devised is through a variety of types of price discriminations. In discussing price discrimination in modern markets, J. M. Clark[1] states the problem tersely:

> If one had to choose a motto of six words, expressing the most central economic consequence of overhead cost, the first choice might fall upon such phrase as: "Full utilization is worth its cost," but a close second would be: "Discrimination is the secret of efficiency." This last, to be sure, needs to be taken with a proviso: one must know where to stop. The economic basis of it is simple. Existing business may or may not cover all overhead costs, but in either case, if there is spare capacity, added business will cause no added overhead, and will be a gain at anything above differential cost, *so long as it can be kept separate from existing business*, so that existing earnings are not impaired. This leads to a system of making each separate section of the business pay the largest possible yield above differential cost. A "section of the business" may mean a single customer or a single sale, but, in general, classification is limited by the extent to which business convenience makes it practicable, or public sentiment makes it prudent.

It is beyond the scope of this chapter to describe the forms of price discrimination practiced by business concerns. Clark[2] discusses the various forms of differential prices under the headings of dumping, discrimination between localities, different classes of buyers, discrimination according to service, accommodation, or time. Price discrimination is a means of obtaining volume of sales, and the greater the volume the wider the base of production or sales over which overhead costs can be spread.

c. Size of the Business Unit—Contraction Policies.—In order that a business enterprise may continue to operate indefinitely, it is necessary that the prices charged should cover direct materials or cost of the merchandise, direct labor, and overhead costs. Temporarily, during periods

[1] CLARK, J. M., "Studies in the Economics of Overhead Costs," p. 416, University of Chicago Press, Chicago.

[2] *Ibid.*, pp. 420–431.

of depression or of business adjustment, a concern may continue to operate so long as its revenue is enough to cover direct costs plus the amount of variable overhead costs, because a portion of overhead costs remains constant whether or not the business is being operated. An analysis of income in relation to direct costs and variable overhead costs may be used to determine whether it is more advantageous to operate or to liquidate the business enterprise.

When a cost analysis discloses that certain lines of products, departments, or territories are profitable and others are not, there arises the question of policy in regard to unproductive units or divisions. Overhead costs are a prime consideration. Assuming that overhead costs are distributed over all lines and divisions, if an unprofitable product, department, or territory is discontinued, it is likely that fixed overhead costs will not be reduced materially and that the total overhead will have to be redistributed to the remaining units and divisions. The consequent reapportionment of overhead costs will force other units and divisions to bear a larger share, which may cause a loss to be recorded for one or more of them. Even though a line or division is operated at a loss, it should be maintained as a functioning unit so long as its revenue covers direct material, direct labor, variable overhead costs, and a portion of fixed overhead costs.

Size of the Business Unit—Expansion Policies.—An important managerial problem, concerning which the cost accountant can secure valuable cost statistics, is the most economical size of the business unit. Some types of concerns are susceptible to conditions of decreasing cost up to a stage of immensely large-scale production, but others reach a stage of uneconomical operation while still comparatively small operating units. Economical expansion is largely a condition of overhead costs. If additional production or merchandising activities can be added without a corresponding increase in fixed overhead costs, it is profitable to expand, since, with an increase in the number of units produced and sold, the cost of overhead per unit decreases. If in a department store a department selling a new line of merchandise can be added without acquiring new building facilities, fixed overhead costs can be distributed over a larger volume of sales to the advantage of each of the other operating departments. If in a factory an additional product can be processed with existing machinery and plant equipment, or a new line of products can be manufactured with the same equipment during hours, days, or seasons when the production of major products is at a low ebb, the production costs of all types of units is lowered owing to a reallocation of those overhead costs which remain relatively constant.

When additional departments or processes necessitate an expansion in plant and equipment, the problem arises as to whether or not the

additional business will be profitable, either immediately or over a period of time. There develops a race between an increase in the volume of revenue and of fixed overhead costs. Will the expansion mean an increase in depreciation, taxes, rent, power, indirect materials, and supervision in a greater amount than the anticipated increase in revenue from the added operations? If the new business can absorb all the additional fixed overhead costs, then the other lines and departments will not be penalized by the expansion. If it cannot, a temporary or permanent decrease in net profits from other departments and lines must be accepted.

In any business enterprise there is constant experimentation with different functions. New business should be planned after a careful study has been made of the additional fixed overhead costs which such additional activities will entail. Recently, in a Middle Western city, a large manufacturing concern was planning to build an extensive addition to its plant facilities. The management presented to the cost accountant blueprints and estimates of costs covering the building, equipment, and machinery to be required if the project were completed. The plans were so complete that they included the placement of every machine and a classified list of the labor and supervisory force required to man the plant. Assuming a given quantity of production, the cost department was given the task of computing estimates of the fixed overhead costs of operating each department in the proposed project. The direct material, direct labor, and overhead costs per unit of product were estimated, the project was completed, and it was found that the actual costs of operation closely paralleled the estimates.

Another problem closely connected with the growth of business enterprises is whether it is more profitable to increase the activities of a single plant, to build a series of similar enterprises as a horizontal combination, or to divide the enterprise into specialized divisions, each contributing to the final product as a form of integration. The selection of the most profitable form of business expansion is dependent upon such factors as overhead costs, location, public policy, and legal requirements.

Problems in Connection with Distribution of Overhead Costs.—Cost accounting is largely the scientific distribution of costs to such business units as departments, territories, lines of products, units of production, and individuals or groups of employees; the purpose is to distinguish profitable from unprofitable activities and to test the efficiency of functioning divisions and of personnel groups. There are complications in the allocation of direct material and direct labor to divisions and units of production, but the most complex problems of cost accounting revolve around the measurement and distribution of overhead costs.

The cost accountant is searching constantly for equitable bases to distribute various elements of overhead cost to units and divisions of the

business enterprise. Since overhead costs cannot be identified with particular units of production and since there are no accounting or statistical means of exact allocation, each element of overhead must be analyzed in the light of the circumstances existing in a particular business enterprise. Overhead-cost distribution bases must be selected to serve several different purposes. Bases are needed to apportion overhead costs to departments, processes, and sales territories. This may be called a "primary distribution." The next stage in the process, which may be called a "secondary distribution," is the allocation of overhead costs to units of production or sale. A general discussion of the problems involved are introduced in this chapter; detailed methods of distribution and accounting for overhead costs are discussed in later chapters.

General Methods of Apportioning Overhead Costs.—Four general methods, better termed "philosophies" or "points of view," which are the foundation for the determination of distribution bases for overhead costs are (*a*) service or use, (*b*) ability to pay, (*c*) efficiency or incentives, and (*d*) analysis or survey of existing conditions. A single concern may use one method predominantly or may use all four, each for a particular phase of activity.

Service or use is the most common basis for the apportionment of overhead costs to departmental divisions and units. It is based on the theory that the greater the amount of service or benefit received by a department or unit from a phase of overhead activity, the larger the share of the overhead expense created by the maintenance of that activity should be borne by that department or unit. Thus depreciation, insurance, and taxes on equipment can be charged to departments on the basis of the time each department used such equipment; overhead costs of the building can be distributed on the basis of space occupied by each department; and units of production may be charged an amount of departmental overhead expense in accordance with the time required for servicing or processing in the department. The method is considered consistent and fair, but it requires more accounting than do other methods since each piece of equipment must be identified with departments and the time element must be accounted for by departments, production orders, or units.

The ability-to-pay principle as a basis of distributing overhead costs is similar in its application to the theory of taxation which holds that those individuals or organizations which have the greatest income shall bear the highest proportion of the tax burden. In cost accounting distributions those departments, territories, lines of products, or units having the largest income may be charged the largest amount of overhead, the allocation being on a proportional basis. Either gross income or net income may be used as a basis of distribution. In ascertaining the prof-

itableness of each salesman's activity, the total overhead costs of maintaining a sales territory can be distributed to salesmen in the territory on the basis of net sales attributed to each salesman. The ability-to-pay principle offers a base which is easily applied, but it is generally considered inequitable because it penalizes the efficient and the profitable units of a business to the advantage of the inefficient ones. For example: if in a department store the manager of each sales department receives as compensation a percentage of the net profits shown for his department and if executive salaries and general office expenses are charged to departments on the basis of net sales, the most efficient manager's department would be allocated a proportionally larger share of the overhead costs and his share of profits would be proportionally smaller than that of a less efficient department manager.

The third base, efficiency or incentives, is the newest approach to the scientific distribution of overhead costs. Although still in the experimental stage it is being applied as a part of modern cost accounting plans to modify older ideas of fair distribution. Efficiency is measured by such managerial devices as budgets, standards, and quotas. A budget, which contains the estimate of the sales expected of a department in a department store for a stated period of time, can be used as a basis of distributing overhead to the department. An incentive is introduced because each department manager aspires to reach or to exceed the volume of sales budgeted for his department. If he surpasses his budget, the overhead costs assigned to his department are spread over a larger volume of sales and the cost per unit or dollar of sale is lowered; if he falls below the volume budgeted to his department, there will be an increased cost per unit or dollar of sale because overhead costs are assignable to a smaller volume. In manufacturing concerns standard costs have been introduced as a means of apprising management as to the operating efficiency of workers, processes, and departments. Standards are determined for direct material, direct labor, and overhead costs. In setting standard overhead costs, it is necessary to scrutinize each item in advance of the fiscal period and to determine the amount of overhead which is necessary to efficient production. The total is broken down into standards for overhead for each hour or other unit of production. Overhead in excess of standard is transferred to Profit and Loss and is not incorporated in the cost of production. In the case of sales agencies, sales quotas are set for each territory and selling overhead costs are distributed on the basis of predetermined sales quotas.

The fourth method of allocating overhead costs, according to an analysis or survey, is used frequently to distribute certain types of overhead that are not closely related to divisions and units of a business and whose remoteness necessitates an arbitrary distribution. For example,

salaries of officials such as the president of a company whose activities are varied and not closely related to individual departments or divisions can be distributed upon the basis of an analysis of all factors involved. Thus a survey may reveal that the president's activities may be largely concerned with sales and with developing new territories, in which case a larger percentage of his salary should be charged to the sales division than to manufacturing. The delivery department for a department store is so varied in its service to sales departments that a single basis for the distribution of the total cost of maintaining the delivery service to sales departments is unsatisfactory. In analyzing the situation, consideration must be given to the number of packages delivered, the size and weight of items transported, the number of deliveries and pickups made, and the mileage traveled. A survey of all these factors, with weight given to the more important ones, may be necessary in order to arrive at a percentage of the total overhead cost of the delivery service chargeable to each sales department. Such a survey need be made only at irregular intervals in order to obtain a sample or cross section of the prevailing conditions. A new analysis is necessary only when conditions underlying the original study have changed substantially. Other illustrations of this method are found in the allocation of electric-light cost to departments on the basis of a survey of the number of lights, size, and estimated hours of use for each department; and in the distribution of elevator cost to departments on the basis of survey of the number of passengers using elevators during typical hours and days.

Predetermined Overhead Distribution Bases.—Overhead costs are incurred daily but generally are not summarized by type until the end of each accounting period. As a step in determining the profit or loss for a month or a quarter, overhead costs are distributed to departments, processes, production orders, or territories, depending upon the type of concern and method of cost accounting in use. Such a procedure entails the accumulation and distribution of actual overhead costs on a historical basis, which is sufficient for many types of concerns but is inadequate where a knowledge of costs is essential in setting prices or in preparing estimates for contracts. Especially in manufacturing and construction concerns, it has been found necessary to know costs for each job before actual processing begins or at least a few hours after the work is completed.

The use of budgets makes possible the determination of estimates of overhead before the beginning of each accounting period. The total estimated overhead is allocated to departments by means of distribution bases, the same bases which are used at the end of the period for the distribution of actual overhead costs. The estimated departmental overhead costs are in turn allocated to production orders through the media of

distribution bases so that total costs can be obtained before the end of the period.

Questions

1. Define overhead costs. What other terms are used frequently to signify these costs? What classifications of overhead costs are commonly used by various types of business enterprises?

2. How do you account for the fact that overhead costs tend to become a proportionally larger share of the total cost to make and to sell products while the shares attributable to material and labor tend to decrease?

3. Why has the importance of overhead as an element of cost had such a belated recognition by accountants and managers of business enterprises?

4. What are the major managerial problems in dealing with overhead costs?

5. Discuss overhead costs as an important consideration in the management's analysis of decreasing cost conditions and idle plant capacity.

6. Discuss overhead costs as an important factor in the determination of managerial policies dealing with production of a variety of products, extension of sales territories, and various forms of price discrimination.

7. Why is overhead cost an important factor to be considered in increasing or decreasing the size of a business unit?

8. What four methods are employed in distributing overhead costs to divisions and units? Discuss and illustrate each method.

9. What are overhead expense distribution bases? How are overhead expenses distributed to cost units in manufacturing concerns?

CHAPTER VIII

BUDGETING—TECHNIQUE AND GENERAL PROCEDURE

Budgeting plays an important role in the development and use of modern cost accounting systems in all types of business enterprises. Budgetary control is planned to assist management in the allocation of responsibility and authority, to aid in making estimates and plans for the future, to assist in the analysis of the variations between estimated and actual results, and to develop bases of measurement or standards with which to evaluate the efficiency of operations.

This chapter is concerned with general principles and procedures of budgetary control. Later chapters contain detailed discussions of the essential relationships between budgeting and cost accounting and show how these two managerial devices can be coordinated and interrelated into a unified, efficient tool in the manufacturing, distributing, and administrative divisions of business enterprises.

Stabilization of Industry through Budgeting.—In many concerns budgeting has aided in a controlled production and has tended to eliminate seasonal variations. Whenever the disturbance of operations and employment is reduced and a more constant rate of production is scheduled per working day, week, or month, there accrues an economic gain to the concern, to labor, and to the public.

The manufacturer usually has two relatively constant elements, *viz.*, management and investment in fixed capital in the form of equipment, machinery, and building. Only when each is used to full capacity and at an even pace is the greatest benefit obtained. In most concerns the executive payroll remains relatively fixed in amount, even though production and sales schedules are subject to violent fluctuations from month to month. Throughout each division and department, the key men in the executive force must be retained so long as there is any flow of production through the plant. Executives are not so efficient or useful to the concern when they are comparatively idle a few months of the year and then are forced to work long hours, under great stress, during peak production months or seasons. Equalizing production throughout the year results in maximum utilization of managerial ability.

It was explained in the preceding chapter that there is a tendency for overhead costs to increase in the majority of enterprises. The demand

of peak seasons encourages additional investments in plant and equipment and the replacement of workmen by expensive machinery. Normally most plants are operated to capacity only a few months of each year and it is difficult to adjust items of overhead cost in proportion to changing production.

Whenever a laborer is laid off, due to seasonal or periodic variations in the production of the plant, there is an individual and social waste involved. There is loss to the plant because every worker has a certain share of the total overhead of the plant assignable to his work, and, if he is not producing, that fixed expense must be assigned to a smaller production, raising the total costs per unit. Likewise each worker has time and money invested in specialized training which can be employed most efficiently only in the occupation for which he is trained. If he is unemployed, his productive efficiency is a waste; if he must transfer his energy to another type of industry, his productive efficiency is greatly curtailed. In either case the community must bear the burden in the form of deteriorated working power, lower production, higher costs, and perhaps in the support of the worker and his family as public charges for a period of time. The concern also suffers indirectly from reduced profits caused by higher costs and a lowered demand resulting from lessened purchasing power of laborers.

Budgetary control is an important factor in the stabilization of production in a number of industries. A large soap manufacturing company is an outstanding illustration of effective production planning. Budgets are made for 1 year in advance. After the sales for the entire period are forecasted, the desired production of various products is planned so that the same quantity of product will be manufactured each working day of the year. Each day of plant operations the same number of workmen are employed and plants, machinery, and equipment are used for an equal number of hours at a constant rate of speed. Contracts are entered into with workmen a year in advance, with a guarantee of a definite number of working days and a fixed number of hours per day. Since the production scheduled is constant throughout each year, warehouses are filled during months when the quantity of products manufactured exceeds the sales and the excess production is disposed of during peak sales months. Such stabilized production should be the goal of every manufacturing enterprise because of the economic benefits which accrue to the firm itself, to labor, and to the public.

Organization of the Enterprise for Budgetary Control.—Before a system of budgetary control can be successfully installed, it is necessary that the organization of the firm be so devised that all lines of authority and responsibility are definitely allocated and defined. The system of budgetary control provides for the separation of functions and the

division of responsibility and requires that the organization be planned so that each supervisor, from the president to job foreman, will have his duties definitely outlined.

Generally the best procedure is to divide the business into the three main functions of selling, manufacturing, and administration. The main office selling division may be separated into such departments as advertising, sales supervision, shipping, credit, collection, and sales accounting, while the selling force in the field may be divided into definite branches, agencies, or territories. The manufacturing division is usually divided into service departments, such as receiving, stores, purchasing, cost accounting, and maintenance, and production departments which are the centers where actual processing is done. A production department may be a large department, including a number of operations or types of work, such as punch press or assembly, or it may be a machine center or operation under the supervision of a job foreman. The administrative division may be divided into such departments as executive office, general accounting, correspondence, and payroll.

Every concern should have an organization chart which shows graphically the main divisions, subdivisions, departments, and territories, and the functions and duties to be performed by each division or department head. In large organizations a manual of budget procedure should serve as a helpful guide in the establishment and maintenance of a system of budgetary control.

A survey of 93 companies, made by the National Industrial Conference Board, discloses that the comptroller and treasurer are the officers most frequently responsible for the supervision and administration of budget systems.[1]

In a few concerns the comptroller or other major executives prepare budget estimates and submit them to departmental executives for revision or approval. In the majority of concerns departmental executives prepare the initial estimates for their departments. This seems the better method because the individuals who are responsible for the performance and enforcement of the estimates are the ones who should originate them. The department heads and their subordinates, with the cooperation of the executive office and the accounting departments, are best able to make estimates since they are in close touch with the existing conditions within their departments. It seems desirable that a budget committee be formed to act in an advisory capacity. The committee should be composed of one or more executives from each of the important divisions of the business. During the period of budget preparation, meetings of the budget committee with departmental executives should

[1] "Budgetary Control in Manufacturing Industry," p. 38, National Industrial Conference Board, Inc., New York.

be frequent, perhaps daily. During the period of the operation of the budget, regular meetings, monthly or more frequent, are necessary in order to consider variations between budget estimates and actual results. The members of the budget committee should aid in obtaining the interest and cooperation of the employees in their respective divisions in striving for budget accomplishment during the periods of budget preparation and operation.

General Procedure in the Preparation of a Budget.—After the organization has been prepared for a budget program, the task of preparing the budget estimates is undertaken. The usual plan is to have the executive or executives in charge of the budget work create standard budget forms on which production plans, estimated income, and expenses may be inserted for each department and division. There should be a central office, preferably the accounting department, to handle the mechanics of the work.

The accounting department should be asked to submit reports for the past few years, showing a comparison of production costs, income, and expenses by subdivisions and departments. An analysis of general business and market conditions should be made with the aid of the statistical department or from data supplied by commercial statistical forecasting agencies and government and trade reports. Conditions in each sales territory should be analyzed, and future sales possibilities ascertained. Sales and production reports, current market and trade data, and estimates of future sales in the territories should enable executives to formulate general policies and plans for the budget period.

A series of conferences between each department and division head and the executive in charge of budgeting or the budget committee are held, during which general operating policies of the concern are reduced to department and division plans. The actual departmental budget estimates are then prepared, and, after being revised and authorized by executives in charge of budgeting, they become the standards of performance for the budget period.

The Length of the Budget Period.—Each individual concern has a tendency to react in a definite way to general business and market conditions, and it is necessary that records of past performance and conditions peculiar to the concern and to the industry be related to the most reliable market indices available. The budget forecast should include sales possibilities, probable prices of materials, labor conditions, and, if new working capital is to be needed or new financing is anticipated, a forecast of conditions in the financial markets. When market and business conditions are rapidly changing, forecasts for a long period of time lead to great inaccuracies. Consequently the relative stability of general business conditions is an important factor in the determination

of the budget period. Since the majority of manufacturing establishments are subject to seasonal variations in their selling and production, it is advantageous for comparative purposes to have the budget period cover the normal business period or a complete cycle of operations.

The plan of using two periods for budgetary control, a long period usually from 1 to 3 years and a short period ranging from 1 to 3 months, is being successfully employed by a number of concerns. The long-term budget consists of general estimates, including seasonal variations, which permit the formation of general operating plans and policies. The monthly or quarterly budgets contain detailed estimates of operating expenses and income which permit the comparison of actual and estimated accomplishments and a careful analysis of the variations. The short budget periods permit the making of adjustments to meet changing market and business conditions.

The Thirteen-period Business Calendar.—Budgetary control is handicapped by the use of the present 12-month calendar. The majority of establishments close their accounting records monthly, with monthly comparisons being made between actual and estimated performance. The comparison of accounting data and performance must be between identical periods of time to be of the greatest value. The present calendar arrangement requires expensive and time-consuming reconciliations of monthly statements and budgets before successful comparisons can be made. The length of the month may be 28, 29, 30, or 31 days, and, with the exception of February, each month contains 4 weeks plus 2 or 3 days. The date of a given month each year falls on a different day of the week from the preceding year, and this fact complicates record and payroll preparation. To avoid these complications, more than 650 companies in the United States and Canada have adopted the 13-month calendar. Under this system the year is divided into thirteen 28-day months, with 4 weeks of 7 days each in every monthly period. Many concerns use the 13-month calendar for all internal records, but use the regular 12-month calendar in their dealings with the public.

Many advantages are attributed to the use of the 13-month calendar. When budgetary control systems are in use, valuable comparisons can be made because of the standardization and equalization of budget periods. The periodic statistical and accounting reports can be more easily prepared and analyzed because the periods are of equal length and the closing periods always end with the same day of the week. The payroll periods are of equal length, and all the disadvantages of split payrolls are avoided.

In the publication "The Thirteen-period Business Calendar" prepared by the Policyholders Service Bureau of the Metropolitan Life Insurance Company, the most commonly used plans are described as follows:

Not all of these companies use the same system in dividing the year into thirteen periods nor in allowing for the fact that the number of days in a year (365 in ordinary years and 366 in leap years) is not exactly divisible by thirteen. In general, two plans are in use. Under one the year always begins on the same day of the week and the extra days are allowed to accumulate for five or six years (depending on the number of leap years in the period) when a fifth week is inserted in the last period. Under the other plan the year always begins on the same date and the extra day or days are included in one of the thirteen periods, usually the last. Each plan has variations. Certain companies, by permitting irregularities in the beginning and closing periods, have each period begin on the same day each year, and have the first period begin on the same date each year.

The most widely used method is that employed by the Eastman Kodak Company. Under this plan the year is divided into thirteen periods of twenty-eight days or four weeks. Each period in every year begins on Sunday and ends on Saturday. The extra days are allowed to accumulate and an extra week is inserted every five or six years. In 1928, for example, the first day of the first period was January 1 and the last day of the last period was December 29. In 1929 the first day was December 30, 1928, and the last day was December 28, 1929. The Eastman Kodak calendar for 1930 began on Sunday, December 29, 1929, and ended December 27, 1930. The extra day in each year and the two extra days in leap year are thus allowed to accumulate and an extra week is inserted in the thirteenth period every five or six years. In 1932 under this plan, it was necessary to have five weeks in the thirteenth period.

Incentive Plans for Budget Performance.—A well-developed system of incentive plans for the enforcement of departmental budgets should be formulated before the introduction of the budgetary program. In too many companies careful estimates of departmental activities have been prepared, with no definite plans made to secure their attainment through the proper stimulation of interest and cooperation of employees. Various types of incentives in the form of piece-rates and bonus plans have been used successfully for many years, but they have been planned as stimulants for direct workers and salesmen and have not included executives, office employees, or indirect factory workers. With the introduction of budgetary control it is possible to put into force bonus systems which will include indirect employees.

If carefully planned and administered, financial incentives may be employed as effective means of enforcing budget accomplishment and cost reduction. Budgetary control requires that definite responsibilities and a division of tasks be set for each class of executives, salesmen, office employees, and indirect factory workers. The budgets should be made for a definite period of time and a comparison of actual results with predetermined estimates should be made periodically. The incentive scheme should include only those variable selling, administrative, and factory

expenses, such as sales, advertising, supplies, power, light, travel, salaries, and wages over which the department and division executives have some control. Fixed expenses such as depreciation, rent, taxes, and insurance should not be included because of their relatively fixed and unchangeable characteristics. The control of direct material and of labor costs may be omitted from the budget incentive plan, because these items are contained in direct labor piece-rate schemes.

Positive incentives are in force in a number of concerns. To stimulate the foremen's interest in their budgets, one plan is to set aside a sum, such as $100 a month, to be awarded in prizes for the best examples of budget performance. These prizes may be given as follows: $25 to the foreman saving the greatest percentage of possible expenses; $20 to the foreman saving the second greatest amount; third prize, $15; fourth $10; and six prizes of $5 each. While this plan lacks scientific qualities and does not compensate in proportion to the savings incurred, it has the advantage of ease of supervision and is a means of maintaining the interest of foremen.

As a part of the budget system of a tire and rubber company, bonuses are given to each department head for meeting his budget requirements.[1] The bonuses are paid once a month and are based on a percentage of the employee's monthly income. The following percentages of monthly income are given for meeting the requirements of the production schedule and each of the variable overhead expense budgets:

	Per Cent
1. For making required production schedule	2
2. Indirect labor expense budget	3
3. Waste budget	2
4. Blemish and repair budget	2
5. Supplies budget	2
6. Maintenance expense budget	2
7. Labor turnover budget	2

The use of incentive plans, built on budgetary principles, for compensating salesmen and sales executives need not be discussed in this treatise. The subject of sales quotas and bonus schemes has been treated at great length in textbooks and periodicals.

SALES BUDGETS

Estimating Sales.—The estimation of probable sales is the most difficult of any of the budget forecasts, and yet upon the accuracy of these figures depends the success of the entire budget system for a budget period. The determination of sales estimates as well as compilation of these data into budgets is a managerial problem whether actual collection and analysis of data are done at the home office or in district offices. The

[1] "The Bonus and the Budget," p. 9, Policyholders Service Bureau, Metropolitan Life Insurance Company, New York.

three main factors or classes of data that should be considered by management in estimating sales are (*a*) information concerning past performance, (*b*) statistics in regard to present conditions within the individual company and in each sales territory, (*c*) data concerning the industry and general business conditions.

The starting point in making a sales estimate is past performance. The sales record for past years, and particularly for the year just ending, should be available to the management in minute detail. The accounting or sales department should furnish reports showing sales of the last and preceding years in terms of classes of products and dollars for each salesman, territory, branch, or agency.

The second essential step in the preparation of sales budgets is the accumulation of data regarding conditions within the company and in each sales territory. The management can obtain a rather vivid picture of sales possibilities through information sent to the home office by salesmen, dealers, and district managers. One plan is to have the men in the field make a survey of conditions in their territories just prior to the beginning of the fiscal year; a better plan is that of obtaining regular reports, monthly or more frequently, regarding business conditions. Internal statistics can be obtained in regard to shipments, numbers, and style of finished and partly finished stock for special order or contract, as well as new, canceled, and unfilled orders.

As an aid to the proper understanding of present sales conditions and possibilities, many concerns have periodic market surveys. These surveys help in the determination of sales estimates by territories, especially when new products or specialties are being marketed. The market analysis usually covers three fields: products, markets, and methods of distribution.

There are other factors, popularly termed "business barometers," which should be considered in preparing sales estimates. Many large concerns have their own staff of statisticians who attempt to gather all the possible business indices and to weigh and to relate them into a forecast of market conditions for the industry. The following are important indices of general business conditions:

a. Exchange quotations in regard to stocks, copper, rubber, grains, and cotton.
b. Unemployment conditions.
c. Government crop reports.
d. Steel, coal, and oil production.
e. Wholesale price indices.
f. Bank clearings.
g. Interest rates.
h. Business failures.
i. Corporation earnings.
j. Carload shipments.
k. Shipments to and from foreign countries.

These statistics may be obtained from such United States Government reports as the publications of the Department of Commerce, the Department of Labor, and the Federal Reserve Board; from daily papers, financial journals, and publications of large banking and financial institutions; and from private statistical services.

The Sales Analysis.—Records in regard to past performance, data concerning sales and competitive conditions within the concern and the industry, and statistics indicating general industrial and business conditions are available to management. Upon the ability of executives to relate and to interpret these data and upon their judgment and skill in translating market trends into sales forecasts depend the effectiveness of the system of budgetary control and the success of the operation of the concern for the period involved. Statistics can be supplied and trained statisticians can be employed to explain their use, but final interpretation of the data and the setting of the detailed sales estimates are functions of management.

A common procedure is to analyze the data in regard to each territory and to prepare a territorial budget showing estimated sales in terms of dollars or in classes of products, or in both, for each salesman or district. If possible, sales estimates should be set in terms of quantities of the various classes of products. Since the budgets of all the production departments are based on the sales estimate, difficulties arise if sales estimates are in dollars only and not in terms of quantities of each product or classes of products. The production departments must know the estimated demand for each class of product so that all orders can be filled and finished goods inventories will not be overstocked on some lines and depleted in others. Sales estimates, also, should be studied in regard to classes or types of products which carry the largest margin of profit so that sales budgets can be constructed which will yield the greatest aggregate return. Sales budgets, in terms both of quantity and of dollars, should be broken down into monthly estimates so that sales quotas can be determined for salesmen and coordination can be obtained between sales, production, and inventories of finished goods. Budgets prepared by territories showing monthly estimated sales, in terms of both quantities and dollars by salesmen for each class of product, should be summarized in a master sales budget upon which the compilation of manufacturing and administrative budgets depends.

SELLING EXPENSE BUDGETS

Classification of Selling Expenses.—There is no uniformity of opinion among students of accounting theory and practicing accountants as to what items should be included in the distribution-cost classification because of differences in sales policies, functions, and activities in different

organizations. For example, in some concerns the credit, collection, billing, and shipping departments are under the control of the sales department; in others the shipping department may be under the direction of the manufacturing division and the credit and collection functions under the supervision of the administrative division. In still other organizations these functions are performed in branches or territorial offices.

Selling expenses can be divided into three classes:

a. Cost of demand creation and securing orders.
b. Cost of handling orders.
c. Cost of supervision of salesmen.

Under the first class may be grouped such expenses as salesmen's salaries, commissions, traveling expenses, and all types of advertising. Cost of handling includes all expenses of filling orders and collecting the money exemplified by storage, packing, shipping, freight, billing, credit, and collection costs. Supervision costs are salaries, traveling expenses, bonuses paid to the general and district sales managers, general sales office expenses, and bad debt losses.

Preparation of Selling Expense Budgets.—After sales forecasts have been made, management is in a position to prepare estimates of the amount of selling expense necessary to sell the quantity of products shown in the sales budgets. A budget estimate for each class of selling expense such as advertising, salaries, commissions, demonstration expenses, and supplies should be prepared by the general sales manager with the help and advice of assistant sales managers and other company executives. The accounting department should present to the sales manager a statement of the amount of each class of expense, broken down by territories and departments, for the past few fiscal periods. District or territorial managers and sales department heads should supply their individual estimates of the necessary expenditures for each class of expense, chargeable to their territories. Other general information such as anticipated changes in transportation rates, taxes, rents, supply costs, and newspaper and periodical advertising rates should be considered in preparing the individual selling expense budgets. The final budgets are presented to the budget director or budget committee for final approval.

MANUFACTURING BUDGETS

Forecasting the demand for products is a problem to be solved by the sales, statistical, and executive departments. The manufacturing division has the problem of translating sales estimates into production planning in the most economical and efficient manner. Manufacturing budgets aid management in keeping production at an even level and in controlling the use of material, labor, and equipment.

There are two important factors concerned in budgeting for the manufacturing division: the development of a production schedule in terms of units of each class of commodities to be produced and an estimate of the costs that will be incurred in the completion of this program. The first factor refers to the production budget; the latter refers to such manufacturing budgets as materials, labor, factory overhead expense, and plant and equipment.

Production Budgets.—Production budgets deal with the determination of the total estimated volume of production; with the division of the estimated output into classes or types of products; with the scheduling of operations by days, weeks, and months; with the establishment of finished goods inventory requirements; and, finally, with the storage of finished products until delivery can be made in accordance with sales orders. In the majority of cases production budgets are based upon sales budgets which have been prepared to show the estimated sales in terms of units for each class of product. A few companies find it impracticable to forecast sales because of frequent style changes in the product or because they manufacture largely according to special order. In such cases the production budget is based upon past experience and orders already on hand for future delivery. The production budgets of these concerns cover a relatively short period of time.

Materials Budgets.—Materials budgets should be based upon the production budget, since the amount of direct material used in manufacturing varies directly with the number of units of output. The problems in connection with materials budgets include the preparation of estimates of raw-material requirements necessary to produce the goods as shown in the production budget, scheduling purchases in required quantities at the time needed, and the controlling of raw-material inventories.

In most cases the production budget shows the total production of each class of products by weeks or months. The materials budget, which comprises a list of both the direct and indirect material requirements for the budget period, is prepared through the cooperation of the purchasing, planning, and production departments. In companies whose products are of standard design and specification, the preparation of schedules of direct material requirements is relatively easy. Products may be analyzed to such a degree that the exact material requirements for each class are definitely established and the preparation of the materials budgets consists of multiplying the number of units of each class, as shown in the production budget, by the standard or estimated material requirements for that class, due allowances being made for material spoilage and minimum stock requirements.

The purchasing department generally is responsible for the purchasing budget. Many factors such as the amount of working capital available

for inventory investment, available stockroom or warehouse space, cost of handling stocks, insurance on inventories, inventory obsolescence and shrinkage, and the probability of market-price changes should be considered in connection with the purchasing budget. The actual budget forms vary according to the type of business, but ordinarily the budget will show production requirements in the form of the estimated quantities and the estimated prices of each class of material for each week and month. Indirect materials (supplies) may be included in the purchasing budget in a separate section or a special purchasing schedule may be prepared. In the majority of concerns the indirect material schedules are included as a part of factory overhead expense.

Labor Budgets.—The labor budget is largely dependent upon the production budget, but consideration must be given to such factors as the rate of turnover of the various classes of labor, wage-payment plans in force, and cost accounting methods in use. If the rate of turnover is large and some training and skill are necessary to prepare new workmen for a specific kind of work, due allowance must be made in terms of hours and of labor cost. In plants producing standard products, the task of estimating direct labor costs consists of analyzing labor hours and labor cost expended upon each type of product and of multiplying these estimates by the production as shown in the production budget.

The task is more difficult in special-order plants. In many concerns straight time is still the predominant method of compensation. There is no standard or incentive involved in the system, and it is impossible to predict accurately the productive capacity of any one worker, as his output may vary from day to day. Forms of piece-rates also make the work of preparing the labor budget a difficult one. The worker may receive a combination of a day and piece-rate, or he may be paid a flat rate per unit of output with a bonus if his work passes a certain quota. Such forms of wage plans make the task of estimating labor difficult because of the many contingent features which they introduce. Where no definite standards can be used, the preparation of labor estimates is made by the factory manager and the foremen or job foremen in charge of each division. Each foreman should be given a schedule of the output expected of his division so that he can estimate the number of workers of each class which will be needed and the time required to perform the operations. His knowledge of prevailing conditions within his division and of past operating experience can be used as a basis. The classification of workers and of direct labor hours required for each department is translated into direct labor costs and is modified to conform with estimated salary and wage changes by the payroll department. The labor budget can be prepared in terms of departments, processes, or operations under the supervision of the planning or production depart-

ment to show the estimated weekly and monthly number of direct labor hours and of direct labor cost for each product.

Indirect labor is usually considered as an overhead expense, but in a few concerns the estimates for this type of labor are included in the labor budget.

Factory Overhead Budgets.—Most companies divide their overhead expenses into two classes, fixed and variable. The former includes such expenses as depreciation, taxes, and insurance which do not vary with the productive activity of the plant, and the latter comprises controllable items such as supplies and indirect labor which vary to some degree with the volume of production.

The basic type of overhead budget is one which is prepared for the concern as a whole and which shows the estimated amount of each expense for the budget period. This master budget or overhead expense summary sheet should be supplemented by a detailed budget for each item of overhead expense and by a budget of the estimated expenses for each service and production department. The preparation of budgets for the fixed overhead expenses is a relatively simple matter as the amount can be forecasted with almost perfect accuracy. When closely examined, however, the number of expenses which remain constant regardless of the volume of production are relatively few. Property taxes, fire insurance, rent, salaries of production managers and foremen, and depreciation of buildings can safely be included in this classification.

Budgets of the fixed expenses are not dependent upon sales or production budgets. The expenses of each type which have been incurred in the past and knowledge of any changes which may occur during the ensuing budget period are the two determining factors in setting the estimates. Rental contracts generally are made at least a year in advance and any changes in the amount for the next period are likely to be known when the budget is prepared. Tax rates, insurance rates, and property valuation for the next period either are known or can be estimated with a high degree of accuracy. Usually a separate budget sheet is used for each item of expense, the total being subdivided by departments or divisions. Estimated rent is assignable to various service and production departments on the square-foot basis; property taxes and fire insurance may be distributed on the basis of the value of equipment in each department; foremen's salaries may be assigned directly to the department in which they are employed; and the salaries of general superintendents and production managers may be prorated on such bases as total labor hours or direct labor hours. In its final form, each budget for a fixed overhead expense item should show the total estimated expense for that item and the share of the total assigned to each service and production department.

The variable or controllable expenses are more difficult to estimate. Such budgets as indirect materials (supplies), indirect labor, repairs, and maintenance are prepared through the cooperation of the foremen or department heads and the factory executives. The scheduled production and operating conditions for the next period must be considered because these expenses vary with productive activity. Such budgets as power, heat, light, and water are generally prepared by the cost accountant with the help of the engineering staff and the major factory executives. The records of past experience must be supplemented by consideration of present costs and the effect of the budgeted production upon these expense items during the next period. All budgets should show the total amount of each class of expense, classified by both service and production departments.

Plant and Equipment Budget.—The budget of plant and equipment which deals with plans for expansion is directly dependent upon the production and manufacturing expense budgets. Its creation is an administrative function and should be closely tied in with the general operating policies of the business. Expenditures for plant and equipment necessitate additional capital which carries the administration directly into the problems of financing, the stability of the anticipated demand, the danger of overexpansion, and the expected return on the additional investment.

Plant and equipment budgets are generally based on long-term forecasts. Public utilities such as telephone companies and light and power concerns are noteworthy examples of organizations basing their expansion plans on long-term budgeting. Population growth, building statistics, growth of factories, per capita wealth, and many other important factors are carefully charted as a basis for the preparation of their plant and equipment budgets.

One or more budgets of plant and equipment may be prepared. The usual procedure is to show the amounts estimated for new equipment, replacements, or alterations by months and years for each department or division of the plant.

Questions

1. Why has budgeting become such an important part of the managerial control of all types of business and governmental enterprises?
2. Why is budgeting an integral part of modern cost accounting methods?
3. Discuss the economic significance of budgeting. How may effective budgetary control be an important influence in the stabilization of an industry and of an individual concern?
4. Before a firm adopts a system of budgetary control, what plan of internal organization should be provided? What divisions and lines of authority should be established?

5. Trace briefly the general procedure followed in budget preparation.

6. What factors determine the length of the budget period for an individual firm? Discuss the use of the 13-period calendar, indicating the methods employed and the advantages accruing from the plan.

7. Discuss incentive plans for budget performance. In your opinion what types of rewards are the most effective?

8. Describe the general procedure of preparing sales budgets.

9. How are selling expenses classified? What items of expense are included as selling expenses?

10. Describe the procedure of preparing selling expense budgets. What types of budgets are required for an enterprise selling its products through its own established territories and district agencies?

11. What types of production and manufacturing budgets are generally prepared? What forms of data are included in production budgets?

12. Discuss briefly the preparation of each of the following budgets:

a. Materials budget.
b. Labor budget.
c. Factory overhead expense budget.
d. Plant and equipment budget.

PART II

ACCOUNTING FOR PRODUCTION COSTS

CHAPTER IX

JOB ORDER COSTS: GENERAL PRINCIPLES; MATERIAL AND LABOR COSTS

Types of Manufacturing Concerns.—There are such varied types of manufacturing concerns that minute classification is impossible, but, for purposes of cost accounting, two general classes can be distinguished: the mass-production industry which produces standard products, and the special-order type of industry with an output of special or custom-made products.

The mass-production concerns are exemplified by such enterprises as chemical plants, flour mills, foundries, canning factories, lumber mills, paper manufacturing, paint factories, tire and rubber companies, processors of foodstuffs, mining, oil producing, and textile manufacturing. This classification includes the vast majority of manufacturing establishments in the United States. The mass-production concern is characterized by quantity production of uniform standard products. The production process generally is continuous, the finished product being the result of successive operations. The products are of uniform variety, are interchangeable in size and form, and are manufactured in accordance with standard specifications. Even though there is a variety of types of products and styles with frequent changes in specifications, records can be maintained to exhibit the total number of units of each kind manufactured in each process. Economies resulting from large-scale production and minute division of labor tend to encourage the growth of mass-production plants and the standardization of consumer demand.

The special-order type of industry is typified by such enterprises as printing shops, construction companies, machine-tool manufacturing, repair shops, structural-steel companies, woodworking shops, and specialty shops producing custom-made hats, clothing, shoes, and musical instruments. The special-order industry is characterized by the manufacture of products in clearly distinguishable lots in accordance with special orders and individual specifications. In mass-production plants, goods are manufactured for stock for an anticipated demand; in special-order enterprises production is planned to supply customers with a specified number of units of a certain type at an agreed sales price or upon a cost-plus basis. Generally each sales order contains specifications to meet the requirements of a customer.

Types of Cost Accounting Systems.—Two general types of cost accounting systems have been devised to accumulate cost information for the management of manufacturing concerns, *viz.*, process costs and job order costs.

Process cost accounting is used effectively in mass-production plants. The general plan of operation is relatively simple. In order to accumulate costs, each process or operation in the plant is designated as a separate cost center. Analysis sheets are used for each process to record production in terms of units such as tons, pounds, gallons, or cans on hand at the beginning of each period, received and processed during the period and inventoried at the end of the period. During each fiscal period, materials are requisitioned from stockrooms and are charged to particular process accounts; payrolls are used as the basis for charges of labor costs to process accounts; and overhead expenses are collected through the journal, voucher register, or cash disbursement journal, or are posted directly from expense vouchers to a Factory Overhead Expense controlling account, the details being recorded in a subsidiary expense ledger. At the end of each fiscal period overhead expenses are distributed, either directly or through the use of allocation bases, to process accounts. The total cost of each process, which consists of direct materials, direct labor, and overhead, is divided by the number of units completed in a particular process in order to obtain the average unit cost for the process during the period. In order to obtain the total cost of a product, it is necessary to add together the costs of all processes through which a product has passed.

The operation cost system, which frequently is described incorrectly as another type of cost system, is in reality a refinement of or an adjunct to process cost accounting. The accounting procedure is identical with the one followed in process accounting, except the costing division is an operation rather than the larger sphere of activity designated as a process. The operation cost system entails more detailed accounting, but it supplies management with a more minute analysis of costs and provides a better foundation for the establishment of standard costs.

The job order cost system can be used when products are manufactured in clearly distinguishable lots and when it is practical to keep a separate record of each lot from the time production is begun until it is completed. A production order or cost sheet is created for each special order of products that is to be processed in the plant. The production order is used to record direct material, direct labor, and an estimated amount of overhead costs at each stage of production, and it exhibits the total cost of the order when goods are completed and transferred to finished stock or sent to the shipping department.

accounting in manufacturing enterprises which is A type of cc tly as a distinct system of costing is known as the described freque m." It is not a separate type of cost system, but it "class cost sys amental principles of both job order and process cost combines fun A major criticism of job order cost accounting is the mass of accounting. involved and the large number of production orders or cost detailed wor must be handled. The class cost system retains the general sheets whic f the job order plan which involve the use of production orders principles terial, labor, and overhead separately for each batch of produc- to cost m t limits the number of production orders in order to curtail the tion, but f detailed costing. It is assumed that production can be divided amount sses of like products and that the costing of each class of products into cl than of each special order will give sufficiently accurate data. In rather ing production, special orders requiring processing of similar prod- plan are grouped together and a single production order is prepared to uct w costs for the combined production. The total cost, summarized in sho production order, is then divided by the number of units completed to th tain the average cost per unit. Thus the total cost for a large number ob similar batches of products is obtained and an average cost per unit is a rived.

This type of cost system has a limited use since there are not many special-order industries in which various classes of products are sufficiently similar in their processing techniques to warrant combining several of them for costing purposes. The method is much less expensive than is the job order plan, because one production order can be used instead of a dozen or more. It has been used successfully in foundries and in the paper industry.

Two Types of Cost Systems in a Single Business Enterprise.—Frequently both the process type of cost system and a form of the job order cost system are operated in the same business enterprise. Business establishments comprising foundry operations and one or more machine departments may find it advantageous to accumulate costs for separate operations and to obtain average costs per unit in the foundry, while in the machine shop—where special orders are processed—material, labor, and overhead costs may be recorded in a separate production order for each job.

The use of two types of systems is exemplified by a paper manufacturing company composed of two separate divisions, *viz.*, the paper mill converting wood pulp and other raw material into corrugated paper stock, and the box factory where boxes of varying sizes and types are manufactured in accordance with special orders. In the paper mill, costs are accumulated for each operation, and an average cost per unit for each

operation is obtained. In the box factory each order sales department is the basis for plans for the producti number of boxes according to specifications provided by production order is prepared for each job, and direct m labor, and an estimated share of total overhead costs are for the order. Therefore the total cost of the finished produ bination of average costs of raw materials obtained from the and job costs accumulated for each order in the box factory.

ral types of cost cost information process costs and duction plants. er to accumu- gnated as a process to

Purposes of Job Order Cost Accounting.—Job order cost a frequently is called "job cost," "production order," and "specif cost accounting. The heart of the system is the production orde sheet which is used as a daily record of direct material, direct lab estimated factory overhead cost for each department or operation f entire course of production. Control of detailed costs on produ orders is maintained as goods proceed through the plant by mean controlling accounts in the general ledger, which summarize costs products put into process, transferred to finished goods, and finally sc

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Through the media of production orders, management is informe immediately after the completion of each job in each department, of tl estimated share of the general factory overhead cost which the job shou bear in addition to the direct material and labor costs actually incurred When the total cost of each job is computed, if there are a number of unit comprising the job, the average cost per unit can be obtained by dividin the total cost of the production order by the number of units completed Management is in a position to set selling prices of special orders and to determine the estimated profit or loss on each order before goods are sold The file of completed production orders constitutes an excellent record o past costs which enables management to determine costs and to quot prices for orders of a similar nature which are in prospect. Likewise th trend of material, labor, and overhead costs can be ascertained by comparison of production orders completed daily with production orde on file representing earlier production.

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Production Orders.—Production orders differ as to type and purpose classification may be indicated as follows:

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a. Orders for custom-made or special-order production for customers.
b. Orders for products and parts manufactured for stock.
c. Orders for parts or machines for plant use.
d. Orders for repairs to products for customers or repairs to plant machinery.
e. Orders for reconditioning of defective work.

Production orders differ in form and amount of detailed informatio In some concerns it may be advantageous to list in each order the quan tity and cost of each type of material and the amount and cost of eac class of labor required in the completion of work, while in other factorie

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a summary of material and labor requirements for each order may be sufficient. Some establishments may not be departmentalized, with the result that material, labor, and estimated factory overhead costs may be recorded in production orders for the factory as a whole without regard to specific production departments or operations. Other factories may be departmentalized or minutely divided into operation centers, with the result that production orders are designed so as to exhibit the tabulation of material, labor, and estimated factory overhead expense for each production department or operation.

Production orders may be prepared to accomplish various purposes. The production order may be primarily a cost sheet containing an order number, a brief description of the work to be done, the number of units to be processed, whether for special order or stock, and material, labor, and factory overhead costs charged to the order. Or a more elaborate form of production order may be planned so as to supply, in addition to cost information, complete instructions, specifications, and factory production plans to supervisors and workmen. In many factories and construction projects, elaborate designs, blueprints, and specifications are necessary for each job, and production orders are limited in their use to the accumulation of detailed cost information.

Illustrations of two simple types of production orders are given below. Exhibit 26 is an example of an order which could be used in an enterprise in which production activities are not departmentalized, or in a single department, such as the repair department, of a factory which employs process cost accounting elsewhere in the plant.

Exhibit 27 illustrates a production-order form containing a departmental classification of direct material, direct labor, and applied factory overhead costs. The form can be used in business enterprises which maintain separate production departments.

Production orders representing goods in production processes are controlled in the general ledger by a Work in Process account or, in lieu of a single account, by three accounts termed Materials in Process, Labor in Process, and Factory Overhead Expense in Process. The Materials in Process account summarizes as debits the total amount of direct material charged to production orders during the accounting period; the Labor in Process account is debited for the total amount of direct labor cost added to production orders; and the Factory Overhead Expense in Process account in debited for the total amount of estimated factory overhead expense applied to production orders during the period.

Accumulation of Costs in a Decentralized Cost Accounting Organization.—Before outlining the general procedure for the accumulation of cost in production orders and the control of such costs in the general ledger, it is necessary to describe two general types of organizations of

PRODUCTION ORDER (COST SHEET)

DESCRIPTION

_____

_____ Order No. _____

_____ Buyer's purchase order No. _____

Date ordered _____ Date finished _____

MATERIAL

Date	Quantity	Description	Unit cost	Total cost

LABOR

Date	Employee	Hours worked	Rate	Ext.

SUMMARY

	Material				
	Labor				
	Applied overhead				
	Total				
	Average cost per unit				

Exhibit 26.—Production-order form for plants not departmentalized.

PRODUCTION ORDER (COST SHEET)

Model_____ Production order No._____
Style_____ Sales order No._____
Quantity_____ Date wanted_____
For_____ Date started_____
Date completed_____
Contract price_____

Description:
Specifications:

DIRECT MATERIALS

Date	Req. No.	Purchase order No.	Dept. I	Dept. II	Dept. III

DIRECT LABOR

Date	Dept. I		Dept. II		Dept. III	
	Hours	Amount	Hours	Amount	Hours	Amount

APPLIED OVERHEAD EXPENSE

Date	Dept. I		Dept. II		Dept. III	
	Machine hours	Amount	Labor hours	Amount	Labor hours	Amount

SUMMARY OF COST

Dept.	Direct materials	Direct labor	Applied overhead expense	Total cost
I II III				

Exhibit 27.—Production-order form for departmentalized plants.

cost accounting activity, *viz.*, the decentralized and the centralized methods of recording costs.

When the decentralized plan of recording cost information is in use, a production order actually accompanies jobs as they are transferred from one department to another. The production order is attached to plans and specifications which are sent to the supervisor of the department or operation initiating the production process. The supervisor, foreman, timekeeper, or cost clerk in the department is responsible for recording cost information in the production order. Material requisitions are used as the basis for charging material costs to the order; time tickets and piece-rate reports are records from which labor hours and labor costs are obtained; and a predetermined rate per hour of direct labor, machine-hour, or dollar of direct labor cost is given to the department as the basis for the distribution of factory overhead to each order. In production departments handling many production orders daily, it is necessary to employ a cost clerk to accumulate and to record cost information; in departments or factories with a small volume of orders and relatively few items of cost, a timekeeper or foreman may tabulate cost information in production orders in addition to other duties. When products represented by a production order have been completed, the units and the production order are transferred to the next department where processing is resumed and where cost information is recorded in the production order by the cost clerk or department representative of that department.

Accumulation of Costs in a Centralized Cost Accounting Organization.—When the centralized plan of accumulating cost information is in use, production orders do not accompany production through the plant. Each production order is given a number which corresponds to the number assigned to a batch of production which is to be processed. The production order for each job is retained in the cost accounting department for the purpose of accumulating cost information for the particular order as the job is processed in the factory. Copies of material requisitions and of time tickets or wage reports, bearing production order numbers and representing work done for each day or week, are sent to the cost department to be used as the basis for charges for direct material and direct labor to production orders. A schedule of factory overhead distribution rates, with one rate for each production department, is prepared by the cost department as the basis for charges to production orders for factory overhead costs.

Each plan has several advantages and disadvantages. The plan of a centralized cost accounting organization is advantageous in that all cost information recorded in copies of material requisitions, time and labor reports, and factory overhead expense distribution schedules for each department are on file in the cost department where tabulation is made in

production orders by clerks who specialize in cost work. In addition production orders representing all production in process and completed are located in the cost department.

The decentralized plan has the advantage of having cost entries made in production orders in departments where the actual work is done and where the attention of department and plant executives can be focused on material and labor costs as they are incurred. There is the disadvantage of having departmental employees, who may not be properly trained or interested in cost accounting, responsible for accumulating cost information and tabulating it in production orders.

ACCOUNTING FOR MATERIALS AND EQUIPMENT

Job order cost accounting requires that direct materials and their cost be distinguishable by jobs at each stage of the production process, from the time materials are requisitioned from stockrooms until products are completed and transferred to finished stock. Indirect materials and supplies must be accounted for from the time they are issued from stockrooms until properly charged to production and service departments standing orders.

In order to effect a complete system of material control and accounting, it is necessary to devise a number of subsidiary records which will contain detailed material costs and to maintain controlling accounts in the general ledger which will summarize periodically material costs as materials are consumed directly or indirectly in performing production and service functions within the factory. The subsidiary records include one or more stock ledgers, material requisitions, production orders, standing orders for indirect materials, returned-material reports, scrap reports, and inventory reports. The general ledger controlling accounts involved are Materials, Materials in Process, Factory Overhead Expense, and Finished Goods.

Purchases of Materials.—Generally the purchase of materials and supplies for stock is the most important type of purchase made. Vouchers covering materials purchased for stock are entered in the voucher register as:

Materials	xxx	
Vouchers Payable		xxx

In the stock ledger, subsidiary to the Materials account, an entry is made in the received section of the appropriate stock accounts.

Production departments which operate as special-order divisions frequently require special materials and parts which are not stocked regularly. Production would be delayed unduly if materials and parts immediately necessary for work in process were to be acquired and

handled only through the regular purchasing, receiving, and stockroom channels. Consequently special orders initiated by the planning department or production departments are marked "emergency" and are given special consideration by the purchasing, receiving, and testing departments. When such emergency materials and supplies are received, they are sent directly to production departments. The entry in the voucher register required to record materials and parts purchased for immediate use in production departments is as follows:

Materials in Process	xxx	
Vouchers Payable		xxx

A supporting subsidiary entry for the cost of materials and parts is made in the material cost section of the production orders in process for which the purchases were made.

Purchase requisitions are prepared by production and service department executives for materials and parts needed to repair machinery and equipment in the event that the items required are not a part of the regular stock. Upon receipt they are sent directly to the department which requested the purchase without being handled or recorded by stockkeepers. The entry in the voucher register for the purchase of repair materials and parts is as follows:

Factory Overhead Expense	xxx	
Vouchers Payable		xxx

An entry is made in the standing order for repairs charging the department receiving the special materials and parts.

Purchases of Machinery and Equipment.—Purchase requisitions for new machinery and equipment originate with production and service department executives, with the planning department or factory superintendent's office, or with a committee of executives who are responsible for planning capital expenditures. When the equipment is received, it is taken directly to the department where it is to be installed. The voucher covering the purchase and freight is entered in the voucher register as follows:

Machinery and Equipment	xxx	
Vouchers Payable		xxx

If a special column is not used for Machinery and Equipment in the voucher register, it is necessary to record the debit in the Sundry section and to post it as a separate item. An entry may be made to cards or ledger accounts which compose the subsidiary records in support of the controlling account, Machinery and Equipment.

A problem which frequently arises in connection with the purchase of machinery and equipment is the proper handling and disposition of

installation costs. If agencies outside the business enterprise are employed to install machinery and equipment, a voucher is prepared and charged to the Machinery and Equipment account for the total cost of services rendered. The installation cost is a legitimate part of the cost of the asset acquired. The problem differs to some extent when the enterprise uses its own materials and employees in the installation, since the question then arises as to whether or not the concern should be permitted to add to the cost of the machinery and equipment the cost of material, labor, and factory overhead expended in the installation work. In theory at least all costs incurred, including a reasonable amount of factory overhead expense, are a legitimate cost. Since there is no profit element involved, such a cost generally is lower than that which would be paid to another company for the installation work. Accounting practice does not favor the addition of any factory overhead to the asset value unless there is an increase in the regular factory overhead costs due to the installation work. The argument is that regular overhead costs are accruing whether or not the installation work is performed by the enterprise and that it is not conservative accounting to permit a fixed asset to absorb a portion of regular overhead costs. A production order generally is used to record material, labor, and factory overhead expended in installation work. The cost of the completed order is the basis for the journal entry to record installation costs performed by the enterprise as follows:

Machinery and Equipment	xxx	
Materials		xxx
Payroll		xxx
Factory Overhead Expense		xxx

The Factory Overhead Expense account should be credited only for extra overhead costs incurred and charged to that account for the special installation work.

Issue of Direct Materials.—Material requisitions are so prepared as to indicate whether materials obtained from stockrooms are direct materials to be consumed in production processes or indirect materials used for general purposes not directly identified with production orders. Foremen and executives of production departments are responsible for determining which materials are direct and which are indirect. One form of requisition may be designated for use in requisitioning direct materials, and a second form, differing in color or serial number, may be employed for indirect materials; or a general requisition may be prepared for all purposes. The general requisition may contain two columns, one for direct materials and another for indirect materials, so that the proper classification can be made at the time the form is prepared.

Two copies of the material requisition are prepared; one copy is returned, after being priced by the pricing clerk, to the department which requires the material, while the other is filed by the stockkeeper as evidence of the proper issue of materials. The cost clerk in each department or in the centralized cost department makes daily use of the departmental copy of material requisitions as a basis for recording the material cost of direct materials in the Material section of appropriate production orders. The stockkeeper uses his copy of the material requisition as the basis for an entry in the Issued section of the appropriate stock ledger accounts for the cost of the material.

Periodically stockkeepers and production department cost clerks prepare, independently, summaries of the cost of direct materials issued from stockrooms and charged to production orders. The accountant in charge of the general ledger receives the independent summary reports which he checks, one against the other, and then prepares the following journal entry:

Materials in Process	xxx	
Materials		xxx

Issue of Indirect Materials.—Supplies and other forms of indirect materials are requisitioned from stockrooms for use in production and service departments in the same manner as are direct materials. The cost of indirect materials is entered daily in the issued section of individual stock ledger accounts maintained by stockkeepers. Requisitions are summarized periodically and are entered in the standing order for indirect materials or supplies as a charge to particular production or service departments if a departmental organization is maintained.

A summary of indirect materials issued from stockrooms may be compared with the total amount charged to the standing order for supplies. A journal entry is made as follows:

Factory Overhead Expense	xxx	
Materials		xxx

Materials Returned to Stockrooms.—Frequently materials in excess of the needs of production orders are requisitioned from the stockrooms in order that there will be no delay if materials are spoiled or if greater quantities are required than estimates indicate. Occasionally production orders are changed or canceled, and the return of materials to stock is necessary. In such cases a materials returned report is made out in duplicate to show the production order or standing order to be credited, a description of the material, reason for the return, quantity, unit cost, and total cost.

In the subsidiary records an entry for the original cost of the material returned is made in the Received section in black or in the Issued section in red in the appropriate stock ledger account. The production order in question is credited for the cost of the material returned to the stockroom either by changing the amount of material charged to the order or by means of an entry in a materials returned section provided in some types of production orders. The general ledger accounts are affected by means of a journal entry summarizing a number of transactions as follows:

Materials	xxx
Materials in Process	xxx

Indirect materials returned to stockrooms are entered in the same manner in the stockroom records, but an adjustment is made in the standing order for indirect materials instead of in production orders. The general ledger entry is as follows:

Materials	xxx
Factory Overhead Expense	xxx

Materials in Process.—The Materials in Process account is a controlling account in the general ledger which summarizes the cost of materials in process as shown in production orders. It is charged for the total amount of materials which are requisitioned from stockrooms and used directly in production. The materials required for each job are entered in the materials section of the production order for the job. The Materials in Process account is credited for the cost of materials shown in completed production orders and a corresponding general ledger debit is made to Finished Goods. The cost of materials, shown in completed production orders, is transfered to the finished goods subsidiary ledger.

At the end of each accounting period the balance of the Materials in Process account should be equal to the total material costs, representing work in process, charged to production orders during the period. It may be advantageous to transfer the balance of the Materials in Process account to a temporary Work in Process Inventory account until the balance sheet of the period has been prepared and then to reverse the entry at the beginning of the next accounting period. An alternative is to consider the balance of the Materials in Process account as the cost value of inventory of materials in process.

Adjustment of Inventories.—At least once each year a physical inventory of materials, of work in process, and of finished goods should be taken. Inventory reports of the number of units of each class of raw material and of semifinished and finished products are prepared for each stockroom and production department. The raw material and finished stock inventory reports are compared with the book inventory

as shown in the balance section of each raw material and finished stock account in the raw stock and finished goods ledgers. The work in process inventory is verified by comparing production orders representing goods in process with the work remaining in process.

Differences in quantities between the physical and book inventories frequently occur, owing to such causes as miscount of units received and issued, shrinkage, theft, and misplacement. The amount of the shortage and the underlying causes should be determined and the book inventories corrected accordingly. Normal conditions of production are accompanied by shortages such as shrinkage, issue of larger quantities than requisitioned, and theft of small quantities. Journal entries required to adjust the differences between physical inventories and balances, as shown by perpetual inventory records, adjudged to be normal conditions of manufacturing operations are as follows:

Adjustment of raw materials inventory—physical inventory less than stock records:

Entry in general ledger:
Factory Overhead Expense xxx
  Materials xxx
Entry in subsidiary records:
Number of units and cost are recorded in the issued section of the appropriate stock ledger accounts in the stock ledger; entry in the standing order for inventory adjustment, charging the proper service department responsible for the stockroom control.

Adjustment of work in process inventory—physical inventory less than quantities shown in production orders in process:

Entry in general ledger:
Factory Overhead Expense xxx
  Materials in Process xxx
  Labor in Process xxx
  Factory Overhead Expense in Process xxx
Entry in subsidiary records:
Number of units and cost are recorded as adjustments in the appropriate production orders in materials, labor, and applied factory overhead expense sections; entry in the standing order for inventory adjustment, charging the proper production department.

Adjustment of finished goods inventory—physical less than book inventory:

Entry in general ledger:
Factory Overhead Expense xxx
  Finished Goods xxx
Entry in subsidiary records:
Number of units and cost are recorded in the issued section of the appropriate finished goods ledger accounts; entry in the standing order for inventory adjustment, charging the finished goods stockrooms responsible for the shortage.

Occasionally a physical inventory discloses the fact that there are more units on hand than are shown by the book records. In such cases

the entries given above are reversed, the additional quantities and costs are added to stock records or production orders, and the standing order for inventory adjustment is credited, the proper departments being identified. Since such an overbalance is rare, the standing order for inventory adjustment generally does not contain a separate column for credits. Credit adjustments can be noted at either the top or bottom of the form.

Shortages, disclosed by a physical count, which can be attributed to unusual circumstances beyond the control of the manufacturing division and which are not protected by insurance, such as thefts of large quantities and losses due to fire, wind, and water, should receive a different treatment. Such losses should be eliminated from cost to manufacture and are legitimate charges to either Surplus or Profit and Loss, depending upon the policy of the company in regard to handling capital losses. In each of the cases given above, the accounts and subsidiary records credited would be the same, but, instead of Factory Overhead Expense and the standing order for inventory adjustment being charged, the Surplus or Profit and Loss account would be substituted.

Generally a summary report of inventory shortages and overbalances is prepared and a combined journal entry is made debiting and crediting the general ledger accounts indicated above. Details of the adjustment are recorded in the subsidiary records in support of the summary journal entry.

ACCOUNTING FOR LABOR COSTS

Control of labor costs is obtained in job order cost accounting through the use of controlling accounts for Payroll, Labor in Process, Factory Overhead Expense, and Finished Goods in the general ledger and by time tickets, payroll sheets, production orders, standing orders, and the finished goods ledger as subsidiary records. It is necessary that direct labor hours and costs be distinguishable by jobs at each stage of production processes from the time labor is employed in the first department until the job is completed and transferred to finished stock. Indirect labor, consisting of supervisors, clerical employees, factory helpers, building service, and major factory executives, must be accounted for in terms of hours or days of work and by the service and production departments in which their activities are centered.

Accounting for Direct Labor.—Timekeepers or departmental clerks are responsible for the proper classification of labor as to direct labor, indirect labor, and idle time. A time ticket designed to show the production order numbers and the hours and minutes required is prepared for each workman who is paid an hourly wage. In case workmen receive compensation on the basis of the quantity of units completed, a piece-rate card is prepared for each workman to show daily the identity of each

production order worked on, the number of pieces completed for each order, the rate per piece, and the total labor cost for each order.

Time tickets and piece-rate cards are the basis for daily entries by the cost department in production orders, while weekly or monthly summaries form the basis for entries to general ledger accounts. The entries necessary to record the distribution of the direct labor cost to work in process are as follows:

Entry in general ledger:
Labor in Process.....xxx
  Payroll.....xxx
Entry in subsidiary records:
Number of hours and labor cost recorded daily in the labor section of production orders from information obtained from daily time tickets and piece-rate cards.

Accounting for Indirect Labor.—Indirect laborers such as supervisors, clerks, and executives are paid by the week, day, or hour. Their time is recorded on a time card or sheet prepared either by the employees themselves, through the use of a time clock which records the time of arrival and departure, or by a timekeeper in each department. Factory workers who divide their time between direct and indirect labor time have their hours of indirect labor shown on their daily time tickets.

The time tickets and time sheets are summarized weekly, or less frequently, to form the basis for the entry to distribute the portion of the payroll representing indirect labor for the period.

Entry in general ledger:
Factory Overhead Expense.....xxx
  Payroll.....xxx
Entry in subsidiary records:
The indirect labor cost is entered as a charge to appropriate service and production departments in the standing order for indirect labor.

Accounting for Idle Time.—Generally labor time is separated into only two classes: direct labor and indirect labor. If this classification is used, it means that idle time is considered as an indirect labor cost and is included with indirect labor in the Factory Overhead Expense account and in the standing order for indirect labor. The method may be criticized because it does not permit management to determine the amount of idle time or to analyze the causes underlying the idle time factor for each department. Likewise, idle time may be of normal variety and constitute a legitimate charge to the Factory Overhead Expense account, or it may be an extraordinary and abnormal condition which should be removed from factory overhead costs.

The first step in the proper accounting for idle time is the classification of idle time as a separate factor in daily time tickets. Each ticket should

show the amount of time expended on each production order, the time consumed in performing indirect labor as a regular or special assignment, and the hours of nonproductive labor or idle time. If idle time is a normal condition of plant operation, the following entries are made when the indirect labor payroll, classified as to indirect labor and idle time, is distributed:

Entry in general ledger:
Factory Overhead Expense.....xxx
  Payroll.....xxx
Entry in subsidiary records:
Charge appropriate departments in the standing order for indirect labor; charge the appropriate departments in the standing order for idle time.

A separate standing order is maintained for idle time so that executive attention will be directed to the idle time factor and to the department responsible.

If idle time has been caused by abnormal conditions beyond the control of the production division, the cost should be treated as a general profit and loss charge. Examples of situations which might cause an abnormal amount of idle time are a strike, a lockout, a breakdown in machinery, fire, wind, or water damage, any one of which may require the maintenance of a skeleton force of workers even though there is no immediate productive work to be done. If the amount of idle time is deemed abnormal and its cost excessive, entries can be made debiting Loss Due to Idle Time and crediting Payroll when the payroll is distributed, and debiting Profit and Loss and crediting Loss Due to Idle Time when the books are closed at the end of the accounting period.

Labor in Process.—The Labor in Process account is a controlling account carried in the general ledger for the purpose of summarizing the direct labor costs used in production as shown in the labor section of production orders. The account is debited for the total amount of direct labor recorded in production orders from the daily time tickets. The account is credited for the cost of labor shown in production orders which are completed and transferred to finished stock, and the Finished Goods account is debited for the total labor cost.

At the end of each accounting period the balance of the Labor in Process account represents the total labor cost recorded in production orders remaining in process as uncompleted. The Labor in Process account may be closed into a temporary account termed Work in Process Inventory; the latter account is debited and the Labor in Process account is credited. The entry is reversed at the beginning of the new accounting period so that the Labor in Process account will have an opening balance representing the value of labor in process as shown in production orders. Instead of closing the Labor in Process account at the end of the account-

ing period, an alternative is to use the account as an inventory account, affording a similar treatment to Materials in Process and to Factory Overhead Expense in Process.

Accounting for Defective Work.—Inspectors scrutinize work in process at the completion of each stage of production in order to separate defective and spoiled products from those which equal the standard of perfection required of all finished production. Defective work is to

DEFECTIVE WORK REPORT No._____

Production order No._____ No. of Units_____ Date_____

Department responsible for spoilage_____ Nature of defects_____

Department	Description of additional work required	Material cost	Labor		Applied factory overhead	Total cost
			Hours	Cost		

Inspected by_____ Supervised by_____

Exhibit 28.

be distinguished from spoiled work. The former is work in which there is some imperfection which can be brought up to standard by additional materials and labor, while the latter cannot be reconditioned and the units must be sold either as scrap or as second- or third-grade products.

When it is necessary to recondition work which is labeled by inspectors as defective, a defective work report, Exhibit 28, may be prepared and attached to the production order representing the defective work. The defective work report contains the number of the production order, a description of the nature of the defective work, the number of units involved, and the additional cost of material, labor, and applied factory

overhead expense necessary to bring the products up to standard. The entries required to remedy the defective work are as follows:

Entry in general ledger:

Materials in Process	xxx	
Labor in Process	xxx	
Factory Overhead Expense in Process	xxx	
Materials		xxx
Payroll		xxx
Applied Factory Overhead Expense		xxx

Entry in subsidiary records:

The additional cost of the material, labor, and applied factory overhead is added to the defective work report which is attached to production order; entry for material cost in issued section of stock ledger accounts; entry in time tickets for labor cost; entry in the applied factory overhead expense analysis sheet for the amount of overhead expense applied to the defective work.

The method explained is used successfully in concerns where production in process occasionally has to be reconditioned and where the work involved is of some magnitude. In enterprises where small amounts of material and labor are required on many orders to bring them up to standard, it may not be practical to prepare a defective work report for each order. The additional cost may be considered as a general factory overhead cost instead of an additional charge to work in process. If this method of accounting is adopted, the following entries are necessary:

Entry in general ledger:

Factory Overhead Expense	xxx	
Materials		xxx
Payroll		xxx
Applied Factory Overhead Expense		xxx

Entry in subsidiary records:

The cost of material, labor, and applied factory overhead is entered in a standing order for defective work where a charge is made to the production department responsible for the additional cost; the entries for material, labor, and applied factory overhead are identical with those given for the preceding entry.

Accounting for Spoiled Stock.—The cost of production, recorded in production orders as jobs are processed in each department, should include all costs which are normal and necessary in manufacturing operations. When a normal amount of spoiled work is included in costs as a regular operating condition, the number of units completed are divided into the total cost of the order, each unit completed bearing an equal share of the spoiled work. If this method of treating spoiled work is followed, no special accounting treatment is necessary other than the removal of the scrap value of the material from production. The scrap

EXHIBIT 29

CHART ILLUSTRATING IMPORTANT GENERAL LEDGER AND SUBSIDIARY ENTRIES FOR JOB ORDER COST ACCOUNTING TRANSACTIONS

Transaction	General ledger entry	Business papers	Book of original entry	Entries in subsidiary cost records
Purchase of materials and supplies for stock	Dr. Materials Cr. Vouchers Payable	Voucher and invoice	Voucher register	Received section of stock ledger accounts
Purchase of special parts and raw materials for immediate use in factory production	Dr. Materials in Process Cr. Vouchers Payable	Voucher and invoice	Voucher register	Material section of production orders
Purchase of repair parts for emergency use in factory	Dr. Factory Overhead Expense Cr. Vouchers Payable	Voucher and invoice	Voucher register	Standing order for repair expense
Material returned to supplier from stockroom	Dr. Vouchers Payable Cr. Materials	Debit memorandum and voucher	Journal	Red-ink entry in received section of stock ledger accounts
Payment of vouchers for materials	Dr. Vouchers Payable Cr. Cash	Voucher and invoice	Check register or cash disbursement book	None
Direct materials requisitioned from stockroom	Dr. Materials in Process Cr. Materials	Material requisitions	Journal	Material section of production order; issued section of stock ledger accounts
Indirect materials and supplies requisitioned from stockroom	Dr. Factory Overhead Expense Cr. Materials	Material requisitions	Journal	Standing order for indirect materials; issued section of stock ledger accounts
Direct material returned to stockroom from factory	Dr. Materials Cr. Materials in Process	Material returned report	Journal	Red-ink entry in issued section of stock ledger accounts; adjustment of material cost on production order
Indirect materials and supplies returned to stockroom from factory	Dr. Materials Cr. Factory Overhead Expense	Material returned report	Journal	Red-ink entry in issued section of stock ledger accounts; adjustment of indirect material standing order
Adjustment of inventory—physical inventory less than stock records	Dr. Factory Overhead Expense Cr. Materials	Physical inventory sheets	Journal	Standing order for inventory adjustment; issued section stock ledger accounts
Adjustment of inventory—physical inventory greater than stock records	Dr. Materials Cr. Factory Overhead Expense	Physical inventory sheets	Journal	Received section, stock ledger accounts; standing order for inventory adjustment
Distribution of payroll	Dr. Labor in Process (direct labor) Factory Overhead Expense (indirect labor) Cr. Payroll	Payroll sheets, time and piece-rate reports	Journal	Labor section of production orders for direct labor cost; appropriate columns for service and production departments in indirect labor standing order
Vouchering of payroll	Dr. Payroll Cr. Vouchers Payable	Voucher and payroll sheets	Voucher register	None
Payment of payroll	Dr. Vouchers Payable Cr. Cash	Voucher and payroll sheets	Check register or cash disbursement book	None

Vouchering factory expenses for rent, power, repairs, etc.	Dr. Factory Overhead Expense Cr. Vouchers Payable	Vouchers and expense statements	Voucher register	Standing orders for rent, power, repairs, etc.
Recognition of expired insurance expense	Dr. Factory Overhead Expense Cr. Prepaid Insurance	Analysis sheet for adjusting entries	Journal	Standing order for insurance
Recognition of accrued taxes expense	Dr. Factory Overhead Expense Cr. Taxes Accrued	Analysis sheet for adjusting entries	Journal	Standing order for taxes
Recognition of depreciation expense	Dr. Factory Overhead Expense Cr. Reserve for Depreciation	Schedule of depreciation rates	Journal	Standing order for depreciation
Distribution of factory overhead expense to service and production departments	Dr. Service and Production Departments (in detail) Cr. Factory Overhead Expense	Standing orders for factory overhead expenses	Journal	Standing orders for service and production departments
Distribution of service departments expenses to production departments	Dr. Production Departments (in detail) Cr. Service Departments (in detail)	Standing orders for service departments	Journal	Standing orders for service and production departments
Applying factory overhead expense to production orders by a single overhead expense rate	Dr. Factory Overhead Expense in Process Cr. Applied Factory Overhead Expense	Schedule showing computation of the overhead expense distribution rate	Journal	Entry in applied factory overhead expense analysis sheet; entry in applied overhead expense section of production orders
Applying factory overhead expense to production orders by separate production department overhead distribution rates	Dr. Factory Overhead Expense in Process Cr. Applied Factory Overhead Expense—Production Depts. A, B, C, etc.	Schedule of production departments overhead distribution rates	Journal	Entry in applied factory overhead expense analysis sheets for production departments; entry in departmental applied overhead expense sections of production orders
Defective or spoiled work taken out of process	Dr. Materials (scrap value) Factory Overhead Expense Cr. Materials in Process Labor in Process Factory Overhead Expense in Process	Spoiled and defective work reports	Journal	Value of scrap or spoiled work entered in received section of stock ledger accounts for scrap; production order marked "spoiled" and material, labor, and overhead expense loss is entered in standing order for spoiled work as a charge against appropriate production departments
Transfer of goods completed from production departments to finished goods	Dr. Finished Goods Cr. Materials in Process Labor in Process Factory Overhead Expense in Process	Production orders and summary of cost of finished goods	Journal	Production orders marked completed; entry in received section of finished goods stock ledger accounts
Sale of finished goods	Dr. Cost of Goods Sold (cost) Cr. Finished Goods (cost)	Production orders; finished stock ledger	Journal	Entry in cost of sales analysis sheet; entry in issued section of finished goods ledger accounts
	Dr. Accounts Receivable (sales price) Cr. Sales (sales price)	Sales invoices	Journal	Cost of sales analysis sheet

value may be charged to Materials and credited to Materials in Process, subsidiary entries being made in the stock ledger accounts and in production orders.

SPOILED WORK REPORT No._____

Department No._____ Date_____

Production order No._____ Stock account charged_____

Standing order charged_____

Number of units	Description and condition	Cost of order				Estimated sale value
		Material	Labor	Applied overhead	Total cost	

Returned by_____ Received by_____

Exhibit 30

A special accounting treatment is required when spoiled work is of some magnitude and is in excess of the normal amount. Spoiled work may show a marked increase when production is of an experimental nature, or it may result from the employment of untrained labor during labor difficulties or from gross carelessness in the use of materials, labor, and machines. Losses due to spoiled work are production costs in such cases, but the losses should be borne by the department or factory as a whole rather than by adding the burden to the individual production orders which happen to be in production at the time. The loss should be removed from work in process and added to the Factory Overhead Expense account which, indirectly, is apportioned to all production orders during the period.

Frequently some part of the spoiled work may be salvaged and sold either as scrap materials or as seconds. The accounting entries required when spoiled work is deemed to be a general overhead expense are based upon a spoiled work report (see Exhibit 30).

Entry in general ledger:

Materials (Scrap Value)	xxx	
Factory Overhead Expense	xxx	
Materials in Process		xxx
Labor in Process		xxx
Factory Overhead Expense in Process		xxx

Entry in subsidiary records:

The quantity and value of scrap or products having a sale value are entered in the received section of the stock ledger accounts for scrap or spoiled work; the total value of material, labor, and applied overhead expense lost due to spoiled work is entered as a charge against the appropriate production departments in the standing order for spoiled work; the production order is marked "spoiled" and is filed as evidence of inefficient production.

Chart of Job Order Cost Accounting Entries.—In the chart which is given as Exhibit 29 important general ledger and subsidiary cost accounting record entries are illustrated. The chart contains a statement of each transaction, the general ledger entries required, the business papers upon which the transactions were originally recorded, and the entries which are required in subsidiary cost records. A complete explanation of each of the transactions and entries dealing with overhead expense is given in Chaps. X and XI.

Questions

1. What features of job order cost accounting make it a valuable managerial tool?

2. What types of industries are the most suitable for adaptation of job order cost accounting methods?

3. What purposes are accomplished through the use of production orders or cost sheets? What types of production orders can be used?

4. Describe how costs may be accumulated in a decentralized cost accounting organization. How does the procedure differ when a centralized cost accounting organization is used?

5. Discuss the control of materials and supplies as provided for by a complete job order cost accounting system.

6. What general ledger and subsidiary record entries are required to record the purchase of materials for stock? to record the purchase of special materials and parts for immediate use in production processes? to record the purchase of repair parts for machinery and equipment used in the plant? to record the purchase of new machinery and equipment?

7. Describe the procedure required in issuing direct materials from stockrooms to be used in production; in issuing indirect materials from stockrooms to be used in factory operations. What general ledger and subsidiary record entry is necessary for direct materials? for indirect materials?

8. When unused materials are returned from the factory to stockrooms, what type of report is prepared? What general ledger and subsidiary record entries are required?

9. How are material, work in process, and finished goods inventory records adjusted when the physical inventories are less than quantities shown in the accounting records? in excess of quantities shown in the accounting records?

10. Discuss the control of labor costs as provided for by a complete job order cost accounting system.

11. What general ledger and subsidiary record entries are required to record the distribution of direct labor cost to work in process? to distribute the portion of the payroll representing indirect labor used in factory operations?

12. Discuss the proper accounting for idle time. If idle time is caused by abnormal conditions beyond the control of the production division, should the accounting treatment differ from that employed in accounting for normal idle time?

13. What subsidiary records are controlled by the Labor in Process account? What debits and credits are made to the account during the accounting period? What does the balance in the account represent at the end of the accounting period?

14. Describe the accounting procedure required for defective work.

15. How does spoiled work differ from defective work? How does the accounting treatment for normal spoiled work differ from the treatment of abnormal spoiled work and spoiled work which may be salvaged and sold either as scrap materials or as seconds?

Problem 1

The Indiana Manufacturing Co. has a job order cost accounting system. Transactions dealing with materials for October are as follows:

Oct. 1 Balance of materials on hand, $6,000.

2 Purchase of materials for stock, $2,500; purchase order 100; voucher 10.

4 Purchase of a new machine for the factory, $8,000; purchase order 101; voucher 11.

5 Freight bill for purchase order 100, $100; voucher 12.

7 Direct material requisitioned from stockroom for production order 50, $500; requisition 1000.

8 Freight bill for new machine (purchase order 101), $125; voucher 13. Installation cost for new machine, $60; voucher 14.

Supplies requisitioned from the stockroom, $90; requisition 1001. Materials requisitioned for production order 51, $410; requisition 1002.

10 Purchase of materials for stock, $800; purchase order 102; voucher 15.

11 Purchase of special parts for immediate use on production order 52, $75; voucher 16; purchase order 103.

13 $15 of the supplies obtained Oct. 8 on requisition 1001 were returned to the stockroom for credit.

16 Production order 50 is completed, and its cost is transferred to finished goods; $25 of direct material requisitioned for this order and not used is returned to the stockroom for credit.

21 Direct materials requisitioned from stockroom for production order 51, are returned to the vendor because they are defective; amount, $15.

24 Production represented by production order 52 is spoiled because of careless workmanship; the production order is canceled; the scrap value of materials returned to the stockroom is $5.

28 Production order 51 is completed, and the cost is transferred to finished goods.

31 The following vouchers are paid: 10, 11, 12, 13, 14, and 16.

A physical inventory of materials shows a total cost value of $8,000; the shortage is investigated and is found to have resulted from the theft of materials by a watchman who has been discharged.

a. Prepare journal entries to record all transactions for October.

b. Explain in detail immediately below each journal entry the entries required in subsidiary ledger cost records.

Problem 2

Record the transactions dealing with materials, given below, in the following four columns: transaction, general ledger entry, book of original entry, and entries in subsidiary cost records.

1. Purchase of materials and supplies for stock.
2. Purchase of machinery for use in production departments.
3. Material returned to supplier from stockroom.
4. Purchase of materials for immediate use in factory production.
5. Direct materials requisitioned from stockrooms.
6. Materials purchased for immediate use in factory production returned to the supplier.
7. Purchase of parts for repair of machinery.
8. Receipt by stockroom of semifinished parts processed by production departments.
9. Indirect materials requisitioned from stockrooms.
10. Return to stockroom of direct materials requisitioned for production.
11. Adjustment of inventory; physical inventory greater than stock records due to failure to record an invoice of materials purchased.
12. Adjustment of inventory; discrepancy between actual and book inventory due to theft of materials.
13. Materials requisitioned from stockroom for use in installing new machinery and equipment.
14. Indirect materials returned to stockroom from factory office.
15. Payment of vouchers for materials purchased.
16. Direct materials requisitioned from stockroom for production order 898 and charged in error to production order 889.
17. Direct materials requisitioned from stockroom for production order 900 and treated incorrectly as indirect materials.
18. Production order 901, to which direct materials amounting to $80 have been charged, is canceled because of spoiled work; scrap value of materials returned to the stockroom is $10.
19. Material issued from stockroom for research and experimental work.
20. Metal fillings and shavings, valued as scrap material at $25, are received by the stockroom from production departments.

Problem 3

A summary of records of material for the Globe Coated Paper Co. for July shows the following information:

Production order No.	Material requisitioned		Material spoiled		Units completed	Units lost
	Units	Total cost	Units	Scrap value		
11	100	$ 50	10	$ 3.00	85	5
12	60	36			57	3
13	500	500	30	5.00	455	15
14	90	45	3	0.90	87	
15	15	30			15	
16	80	60	5	0.60	75	
17	450	180	20	1.50	420	10
18	125	175	25	10.00	100	
19	20	15			20	
20	140	140	35	17.50	100	5

a. Prepare journal entries to record all the information given in the above schedule for July.

b. Explain what entries are required in subsidiary ledger cost records.

Problem 4

Prepare journal entries to record each of the following disconnected transactions regarding labor costs; explain what entries are necessary in subsidiary cost records:

1. Payroll for the week is vouchered, $7,000.
2. Distribution of payroll: direct labor, $4,000; indirect labor, $1,000; supervision, $800; clerical salaries, $500; executive salaries, $700.
3. Payment of payroll voucher for the week.
4. Included as indirect labor in the payroll for the week is $100 of wages of workmen who were engaged in installing new machinery and equipment.
5. Defective work transferred from production to the stockroom had been charged $80 for direct material and $90 for direct labor; scrap value of work, $10.
6. Goods completed and transferred to finished goods during the week are charged for direct labor totaling $350.
7. Idle time of workers for the week, 80 hr. @ 50¢ per hour.
8. In the manufacture of product X for production order 901, 10 units are found to be defective, and 8 hr. of labor @ 80¢ an hour is required to bring these units up to standard.

Problem 5

On Sept. 1, 19—, the Accrued Payroll account of the Illinois Steel Products Co. has a credit balance of $2,200 covering the payroll for the last two days in August; the monthly payroll period ended on Thursday, Aug. 31, and payroll payments are made weekly on Wednesday for the week ending Tuesday. During September the following transaction occurred:

Sept. 6 Payroll vouchered and paid for week ending Sept. 5, $8,500.
13 Payroll vouchered and paid for week ending Sept. 12, $8,300.
20 Payroll vouchered and paid for week ending Sept. 19, $8,750.
27 Payroll vouchered and paid for week ending Sept. 26, $8,550.
30 The total payroll for the month is $38,300, divided as follows: direct labor, $29,000; indirect labor, $5,000; supervision, $4,300.

Prepare journal entries to record all the payroll transactions for September.

Problem 6

The Michigan Clay Products Co. uses a single account termed Accrued Payroll to record payroll transactions. On Jan. 1, the account has a credit balance of $500. During January payrolls were vouchered and paid in the amount of $8,000. On Jan. 31, a summary of daily time tickets for direct workers and weekly time reports for indirect workers and supervisors shows the following labor costs for the month: direct labor, $7,000; indirect labor, $1,800; and supervision, $900. The following payroll deductions have been considered before paying workers: old-age and survivors insurance tax; advances to employees, $200; company's relief association for employees, 2%.

Prepare journal entries to record the vouchering, payment, and distribution of payrolls.

Problem 7

A summary of time and piecework reports for the American Publishing Co. shows the following information for the week ending Mar. 16:

Employee	Total hours	Production order No.	Classification of indirect work	Rate	Amount before deductions
A	40	1		$ 0.80	$32.00
B	38	1 (18 hr.) 2 (20 hr.)		0.60	22.80
C	40		Clerk	25.00	25.00
D	44		Foreman	45.00	45.00
E	35	3 (20 hr.)	Idle time (15 hr.)	1.00	35.00
F	36	4 (25 hr.)	Repairs (11 hr.)	0.80	28.80
G	40	5 (8 hr.) 6 (32 hr.)		0.90	36.00
H	44		Superintendent	75.00	75.00
I	45		Janitor	15.00	15.00

Payroll deductions to be made are as follows: old-age and survivors insurance tax for each employee; a salary advance of $20 to D; group accident and sickness benefits, 2%.

Required:

a. Payroll for the week.

b. Journal entries to voucher and to pay the payroll.

c. Journal entry to record distribution of labor costs for the week.

CHAPTER X

JOB ORDER COSTS: OVERHEAD DISTRIBUTION

The Problem of Overhead Distribution.—The chief problem in connection with the distribution of overhead costs to production is to find a method of charging an aliquot amount of the total overhead for each department, or for the factory as a whole, to production orders. It involves the budgeting of overhead expenses for the entire factory and perhaps for each production department; the budgeting of production in terms of units, direct labor hours, machine-hours, or direct labor cost for the factory as a whole and, when departmentalization exists, for each production department; the determination of equitable overhead distribution rates for the factory as a whole or for each production department; the application of an equitable amount of overhead to each production order by means of predetermined distribution rates; the accumulation of actual overhead costs for purposes of comparison with the overhead applied to production; and the disposal of variances between actual and applied overhead at the end of each period.

Importance of Budgetary Control in Determining Overhead Rates.—It is necessary to explain the importance of and the part played by budgetary control in job order cost systems. These systems are only as effective as are the plans of budgetary control which underlie them. If the budgets are inaccurately prepared, disproportional amounts of the overhead cost will be applied to production, and management will be misinformed in regard to factory costs and misguided in evaluating departmental efficiency.

A typical formula for the determination of overhead distribution rates is the one for the direct labor-hour rate, which can be presented as follows:

$$\frac{\text{Estimate of overhead for budget period}}{\text{Estimate of direct labor hours for budget period}} = \text{rate per direct labor hour for budget period.}$$

In order to compute the direct labor-hour rate, or other rates such as machine-hours or direct labor cost, it is necessary that a system of budgetary control should produce two budgets: a budget of the overhead costs which are anticipated for the budget period and a budget of production expected for the period in terms of direct labor hours, or some other common denominator such as machine-hours or direct labor cost.

Budgeting of Factory Overhead.—The numerators for the formulas from which predetermined overhead distribution rates are derived comprise the estimates of the factory overhead costs for the budget period. The figure represents the total of the factory overhead budget, which lists in detail the amount of each overhead cost which management expects to be incurred during this period. The budget summary generally shows the total expense for each class, broken down so as to exhibit the estimate of each expense for each month of the budget period. If the business enterprise is departmentalized, budget estimates of overhead are classified by departments, as is explained in the next chapter.

The starting point of all manufacturing budgets is the budget of expected sales for the period, classified as to types of products to be sold. A budget of production, based on estimates of sales, is prepared to show the number and types of products expected to be produced during the period. The estimates of overhead are in part dependent upon such typical fixed charges as existing rental contracts, insurance agreements, and depreciation rates and in part on the amount of variable expenses such as supplies, power, and indirect labor which are dependent upon the production for the period. The accounting department records can be used to prepare the budget figures for fixed expenses because, if consideration is given to changes in insurance contracts, tax assessments, and new rental contracts, past costs can be used as a basis for estimates of these expenses for the budget period. Estimates of variable expenses are made after considering expenses for past periods and the estimates of department executives as to what increases or decreases will occur in each cost if the production budget is realized. The budget of overhead should contain a detailed classification of fixed and variable items so that management may study the relation between variable costs and increases or decreases in production.

Budgeting of Production.—The denominators in the formulas used in computation of overhead distribution rates are obtained from budgets of production prepared in advance of the budget period. Production budgets, which are based upon the estimates of sales, exhibit the number of units of each class of products expected to be processed by production departments during the budget period. The estimates of production are subsequently reduced to estimates of the number of direct labor hours, the number of machine-hours, or the amount of direct labor cost which will be required to produce the estimated number of products of each class.

If only one product is manufactured, an estimate of the number of units of production is a satisfactory denominator in determining the overhead distribution rate for the application of overhead cost to production orders. However, since production generally varies as to type

and style of products it is necessary to resort to a common denominator such as direct labor hours or machine-hours in order to apply overhead to production in an equitable manner. The reduction of estimates of production to direct labor hours or machine-hours is a technical problem which requires engineering and production planning experience. Knowledge of past experience and the ability of executives to visualize the labor and machine time required to complete the anticipated production are prerequisites to the successful budgeting of production activities.

If the business concern is departmentalized, it is necessary to reclassify the budget estimates of production by production departments, so that departmental overhead distribution rates can be computed. Budgeting of production for production departments is discussed in the next chapter.

Seasonal Character of Manufacturing Activities and Costs.—The majority of manufacturing enterprises are subject to monthly seasonal variations during the course of a year in both factory overhead and productive activity. Many factory overhead costs, such as taxes, depreciation, rent, insurance, and salaries of the factory executive staff, tend to be constant and unchanging from month to month. Although the fixed overhead group generally constitutes the largest amount of the total overhead costs, variable costs such as repairs, light, power, heat, supplies, and certain types of indirect labor vary in amount each month or season to such an extent as to warrant consideration being given to their seasonal character. Repairs to buildings, machinery, and equipment frequently are made during periods of slack production so that factory employees can be used in the reconditioning work and a minimum of interference with production schedules can be secured. Heat and light expenses are largest during winter months, even though production during that time is relatively small. The consumption of power and supplies tends to be larger during peak periods of production, although the rate of increase is not in proportion to the increase in productive activity.

Production is even more susceptible to seasonal variation than are factory overhead costs. Many manufacturing establishments, such as those in the clothing industry, must plan style changes in their products months in advance of the spring, summer, fall, and winter demand. Orders are received from the wholesale and retail trade several months before the beginning of each season, which frequently causes manufacturing activities to be geared up to plant capacity for a few weeks each season, followed by a period of low production activity when the factory machinery and equipment are being reconditioned for the requirements of the next season. The automobile industry is an outstanding example of seasonal production.

The cost accountant must meet the problem by arranging his cost plans so that day-to-day costing of production orders will not improperly reflect the monthly increases and decreases in factory overhead and production.

Need for Normal Overhead Distribution Rates.—In business enterprises in which seasonal conditions of overhead and production exist, the cost accounting records should reflect a normal or average overhead charge per unit or per hour of operation during a normal period of operation, usually a year. Costs are used by management for the purpose of comparing the productive efficiency of plants, departments, and operations; as a basis for determining prices for each order; and for the purpose of formulating price lists to be sent to customers. If costs are to be of value to management, the overhead costs applied to production from day to day must be normal or average costs per unit or per hour of production rather than the actual cost for the particular period. If overhead costs are not applied to production orders by means of a normal overhead distribution rate, jobs that are completed during months of low production or of high overhead costs will have a larger amount of overhead applied to them than will work completed in months of large production or of low overhead costs.

Exhibit 31, a hypothetical case of seasonal conditions in a plant producing only one product, ice cream sold in gallon lots, illustrates the need for normal overhead distribution rates rather than monthly distribution rates.

EXHIBIT 31

ACTUAL AND NORMAL OVERHEAD EXPENSE PER GALLON OF ICE CREAM IN A PLANT FOR A YEAR

Month	Factory overhead expense	Production, gallons	Actual factory overhead expense per gallon	Normal factory overhead expense per gallon
January	$ 1,000	2,000	$0.50	$0.23
February	1,080	1,800	0.60	0.23
March	840	2,100	0.40	0.23
April	616	2,200	0.28	0.23
May	875	3,500	0.25	0.23
June	1,500	7,500	0.20	0.23
July	1,980	11,000	0.18	0.23
August	1,800	12,000	0.15	0.23
September	1,400	7,000	0.20	0.23
October	1,000	4,000	0.25	0.23
November	1,012	3,500	0.29	0.23
December	1,870	8,500	0.22	0.23
Total for year	$14,973	65,100		0.23

The average or normal overhead per gallon of ice cream is $0.23, but the actual overhead cost per gallon in February is $0.60 and in August is $0.15. Overhead costs tend to vary with an increase or a decrease in production, but the amount of increase is small in comparison with the increase or decrease in production, since certain costs such as taxes, rent, depreciation, and salaries remain constant. The increase or decrease in overhead is caused by changes in such items as supplies, repairs, light, power, heat, refrigeration, and indirect labor which vary with production and seasons. The fact that overhead costs are abnormally high in January, February, and March may be attributed in part to repairs made during these months when production is small and in part to larger lighting and heating costs.

It is apparent that, if overhead distribution rates are computed separately for each month, unreliable costs will result. Production orders costed in February would contain an applied overhead cost computed by multiplying the number of gallons required for each job by $0.60 a gallon, the separate monthly rate, which will give astonishingly high total costs. The manager may be tempted to discontinue soliciting orders or to raise the price of his product because the cost records show that he is losing money on every gallon of ice cream that he sells. Either policy will prove disastrous, because it will tend to lower production, which in turn will increase the overhead cost per gallon.

Production orders costed in August when production reaches the peak for the year will contain an applied amount of overhead obtained by multiplying the production in terms of gallons for each order by $0.15, the overhead cost per gallon for the month. The manager may be unduly encouraged by the large profit obtained per order and per gallon of ice cream.

In neither case are true costs presented to management. Overhead costs must be considered in terms of the entire production for the budget period, which is usually a year. If a normal rate is used to apply overhead to production, the identical amount of overhead is allocated to a gallon in February as is applied in August, and the management is encouraged to think in terms of normal or average overhead costs per gallon.

Monthly Overhead Variance the Result of Using Normal Rates.—When normal overhead rates are used, the accounting records for a single month may show under- or overapplied overhead. The difference between the amount of actual overhead and applied overhead may be termed "variance."

The monthly variances between actual and applied overhead costs, which occur when the normal overhead rate of $0.23 is applied to the

figures given in the preceding section, are shown in the table below, Exhibit 32.

In 7 months of the year the amount of overhead applied to production was less than actual overhead for the same period, while in the remaining 5 months of the year production was larger and greater amounts of overhead costs were absorbed with the result that the seasonal variations were entirely offset by the end of the year.

EXHIBIT 32

MONTHLY VARIANCES BETWEEN ACTUAL AND APPLIED OVERHEAD EXPENSES

Month	Applied overhead expense		Actual factory overhead expense	Variance	
				Applied less than actual	Applied more than actual
January.....	2,000 @ $0.23	$ 460	$ 1,000	$ 540	
February.....	1,800 @ 0.23	414	1,080	666	
March.....	2,100 @ 0.23	483	840	357	
April.....	2,200 @ 0.23	506	616	110	
May.....	3,500 @ 0.23	805	875	70	
June.....	7,500 @ 0.23	1,725	1,500		$ 225
July.....	11,000 @ 0.23	2,530	1,980		550
August.....	12,000 @ 0.23	2,760	1,800		960
September....	7,000 @ 0.23	1,610	1,400		210
October.....	4,000 @ 0.23	920	1,000	80	
November....	3,500 @ 0.23	805	1,012	207	
December	8,500 @ 0.23	1,955	1,870		85
Total.....	65,100 @ $0.23	$14,973	$14,973	$2,030	$2,030

The accounting treatment of overhead variances at the end of each month is discussed in a subsequent section of the present chapter.

Determination of Normal Overhead Distribution Rates.—A system of budgetary control is a prerequisite to the correct determination of normal overhead distribution rates. The majority of business enterprises pass through a complete cycle of business activity in the course of a year. Thus the budgets of factory overhead and production may be built for a year in advance of operations. A separate budget generally is prepared for factory overhead for each month of the year, and the sum of the 12 monthly estimates of overhead is divided by 12 to obtain an average monthly estimate. In a similar manner a budget is prepared for production in terms of units, direct labor or machine-hours, for each month of the year, and the sum of the monthly estimates is divided by 12 to obtain an average monthly production. The predetermined normal or average overhead distribution rate is computed by dividing the average of the

monthly overhead estimate by the average monthly production estimate. The predetermined normal rate is used to apply a normal amount of factory overhead to each production order processed in the plant. If the rate is correctly computed, all the factory overhead for the year will be applied by the end of the year, although there will be over- or underapplied amounts from month to month.

Methods of Applying Factory Overhead Cost.—Since it is impossible to identify various items of factory overhead with each job processed, it is necessary to find an equitable base which can be used to distribute a portion of the total overhead for the year to each production order. The search has been for a common denominator, a factor common to all production, which is practical and economical in its application and which apportions overhead to production in accordance with its incurrence.

Among the many methods that have been adopted to apply overhead to production the most common are as follows:

a. Percentage of direct labor cost.
b. Production in terms of units.
c. Direct labor hours.
d. Machine-hours.

Percentage of Direct Labor Cost Method.—The formula for the computation of the direct labor cost rate is as follows:

$$\frac{\text{Estimated factory overhead for budget period}}{\text{Estimated direct labor cost for budget period}} = \%\text{ of direct labor cost.}$$

If the estimate of factory overhead for the budget period is $3,000 and the estimates of direct labor payroll costs for the period total $10,000, the normal overhead distribution rate is 30 per cent of direct labor cost. If production order 2015 has a direct labor cost of $10, an amount of $3 will be applied as the production order's share of the total factory overhead.

The direct labor cost method is considered an economical method because payroll costs are always available as an aid in preparing budgets, and each production order has assigned to it an amount of direct labor costs which can be used as a basis for applying overhead.

The method is inequitable because it applies a greater amount of overhead to jobs performed by workers receiving high wages. If workman A is paid $0.50 an hour and workman B $0.75 and if, in 2 hr., each completes the same quantity of work but on separate production orders, the application of a 30 per cent overhead rate would result in a charge of $0.30 for overhead on the production order completed by A and a charge of $0.45 on that completed by B. Workman A and B each used plant facilities, including space, tools, machinery, light, power, and super-

vision, for the same length of time, and the orders they completed in the same length of time should receive the same amount of applied overhead. The direct labor cost method results in the work of high-paid workmen being charged more overhead than jobs completed by workers receiving low wages in spite of the fact that all workers are responsible for the incurrence of overhead costs in almost identical proportion. In fact, workmen who are skilled and efficient may be more economical in the use of power, light, supplies, tools, machinery, and supervision than low-paid, untrained workmen.

In plants or production departments where a uniform hour or day wage rate is paid to workmen of equal skill, it is optional whether the direct labor cost method or the direct labor-hour method is used because the amount of overhead applied to each order will be the same. If such a condition exists, generally the direct labor cost method of applying overhead is employed because it is easier to apply. However, there are few factories or departments in existence in which labor rates and labor efficiency are uniform.

Production Unit Method.—One of the simplest and most satisfactory methods of distributing factory overhead expenses to production is the number of production units such as pounds, tons, hundred pieces, thousand feet, and gallons. The formula for this method is as follows:

$$\frac{\text{Estimated factory overhead for budget period}}{\text{Estimated production in terms of units for budget period}} = \text{overhead expense rate per unit.}$$

Assume that a concern produces a single product, a machine. If estimated factory overhead costs for the budget period are $4,000 and if the estimated number of machines to be produced during the period is 2,000 the overhead distribution rate per machine is $2. If production order 105 schedules the production of 100 machines, $200 of factory overhead will be applied to the order.

The fact that manufacturing concerns customarily produce many products of varying style and kind forces the cost accountant to use a common denominator such as direct labor hours rather than units of production as the basis of distribution. Thus the production unit method can be used in only a few industries or in one or more production departments in a large enterprise employing job order cost methods.

Direct Labor-hour Method.—The direct labor-hour rate is computed by means of the following formula:

$$\frac{\text{Estimated factory overhead for budget period}}{\text{Estimated direct labor hours for budget period}} = \text{rate per hour of direct labor.}$$

If the estimated factory overhead costs total $12,000 and the estimated production for the period in terms of direct labor in 24,000 hr., the estimated rate per direct labor hour is $0.50. Production order 109, to which $10 of direct labor representing 10 hr. of labor at $1 per hour has been charged, will receive applied factory overhead amounting to $5.

The direct labor-hour method is ideally adapted to plants or production departments where labor is the most important cost element. Since the majority of factory overhead costs accrue on the basis of time, the direct labor-hour method is the most equitable means of apportioning factory overhead to production. The number of hours required to complete an order is the paramount factor in determining the amount of overhead that should be charged to the order. An apprentice, paid a wage of $0.25 an hour, generally consumes as much overhead as does a highly skilled workman who is paid $1 an hour.

Direct Labor-hour Method Applicable for Piecework Wages.—When piece-rates are in force in a plant or production department, the direct labor-hour method of distributing factory overhead to production is the most equitable method. If the direct labor cost method is used, a greater amount of overhead is charged to the production of the most efficient workmen who are able to complete a larger number of units in a given time, while the method favors workmen who are slower and complete fewer units per hour. For example, assume that two workmen, A and B, are each assigned to complete a production order, each order covering 100 units of finished product, and that workmen are paid at the rate of $1 per hundred units. Workman A, the speedier of the two completes his production order in 1 hr., his production record being 100 units an hour. Workman B, an apprentice, is capable of completing only 50 units an hour, the completion of his production order requiring 2 hr. of work. Since piece-rates are in effect, the direct labor cost on each order will be the same, $1, regardless of whether the direct labor cost method or the direct labor-hour method of applying overhead to production is used. The amount of overhead applied to each production order will differ as to the type of overhead distribution rate used. If the direct labor cost method is used, the same amount of overhead will be applied to each order regardless of the fact that the work completed by workman B required twice as much time in production as the work of workman A. Such a distribution of overhead is inequitable, and management is not informed as to the true operating efficiency of the two workmen. In reality the production order completed by workman B should be charged twice as much overhead as the other order because it was in production 2 hr. instead of 1 and workman B used plant facilities and consumed overhead twice as long as A. The direct labor-hour method is the preferred one because it considers the time consumed rather than the labor

cost involved. When the two production orders are analyzed by management, it should be apparent that fast workers are to be preferred from the point of view of efficient plant operation and overhead apportionment even though piece-rates are in effect.

Machine-hour Method.—The machine-hour method is similar to the direct labor-hour plan of distribution except that factory overhead costs are applied to production orders on the basis of the number of machine-hours required to complete the production rather than of the number of direct labor hours. The formula used to derive the machine-hour rate is as follows:

$$\frac{\text{Estimated factory overhead for budget period}}{\text{Estimated machine-hours for budget period}} = \text{rate per machine-hour.}$$

The machine-hour method is based on the principle that, in plants where operations are primarily mechanical and machines constitute a more important and costly element than labor, factory overhead costs are equitably distributed to production on the basis of the hours machines are used for each job. Where machines are the most important production media, overhead items such as rent of space occupied, depreciation of machines and plant, repairs to machinery, power, and similar items accrue largely as a result of machine operation, and the time factor, machine-hours, is the most satisfactory overhead distribution base.

The machine-hour method is used most satisfactorily when plants are departmentalized and a rate for each department, or in some instances for each machine, is required. It is not well adapted where a single overhead distribution rate for the entire plant is desired, because generally manufacturing concerns are composed of many different processes which involve a variety of types of hand, bench, and machine operations, performed by different grades of workers. A discussion of departmentalization and the use of the machine-hour method is undertaken in the following chapter.

Accounting for Factory Overhead Costs.—The accounting treatment for factory overhead costs involves three different groups of entries:

a. Accounting for the applied factory overhead costs during the accounting period when the normal overhead distribution rate is used to cost production orders.

b. Accounting for actual factory overhead costs.

c. Accounting procedure required at the end of the accounting period to obtain a comparison between applied factory overhead costs and actual factory overhead costs and subsequently to dispose of the variance existing between the two overhead expense elements.

In the present chapter the discussion and accounting treatment of overhead as an element of cost are predicated upon the assumption

that the manufacturing division of the business enterprise is not departmentalized. The next chapter contains a discussion of the accounting treatment required for enterprises operating as departmentalized organizations which require a separate factory overhead distribution rate for each production department.

Accounting for Applied Factory Overhead Expense.—Daily, as production orders are costed for work completed in the factory, the factory overhead distribution rate, which was predetermined for the year through the use of budgets of factory overhead costs and production in terms of direct labor hours or other bases, is used to apply an amount of factory overhead to each production order. Thus, if the normal overhead distribution rate is $0.50 an hour, production order 1064, which contains direct material cost of $15 and direct labor cost of $20 composed of 20 hr. of direct labor at $1 an hour, will receive a charge of $10 as the amount of factory overhead applied to the order. Charges to production orders for material, labor, and applied overhead expense may be made in the factory where the processing was done or in the cost department from records sent to that department. Since production orders may be transferred from production departments to finished stock when orders are completed, it may be necessary to maintain in the cost department an analysis sheet or register to record and to summarize the amount of factory overhead expenses applied to each production order. A form which can be used to summarize applied factory overhead costs charged to orders is suggested as Exhibit 33.

Applied Factory Overhead Expense Analysis Sheet No. 3

Month: March Overhead expense distribution rate: 50¢ per hour.

Date	Production order No.	Hours of direct labor	Amount of overhead expense applied
10	1064	20	$10
		20	$10

Exhibit 33.

When each job is completed, the normal factory overhead rate is used to apply an amount of overhead to each production order. The

8. Factory overhead applied to production, $100.
9. The payroll is vouchered and paid, $250.
10. The distribution of the payroll shows direct wages, $200; indirect wages, $50.
11. Taxes of $500 and insurance of $100 are vouchered and paid.
12. Depreciation for the period, $1,500.
13. The cost of finished goods is material, $400; labor, $200; and factory overhead, $100. The goods are transferred from the production department to finished stock.
14. Goods are sold on account; the selling price is $1,200 and the cost, $800.
15. One-half of the goods just sold are returned, and the buyer is given full credit. The goods are returned to finished stock.

Problem 3

The Globe Structural Steel Co. fabricates steel products in accordance with specifications contained in special orders from customers. The company uses a job order cost accounting system. Transactions are recorded in three records of original entry: a general journal, voucher register and check register.

Record each of the following transactions for May in the proper record, showing debits and credits to the proper general ledger accounts:

1. Purchase of materials for stock, $5,000; voucher 892 terms, 2/10, n/60.
2. Purchase of repair parts for machine 9, $45; voucher 893, terms, n/30.
3. Paid voucher 892 with check 1216, taking discount.
4. Vouchered semimonthly payroll, $8,000; voucher 894.
5. Paid voucher 894 with check 1217, payable to paymaster.
6. Purchase of special materials for production order 12, $85; voucher 895, terms cash. Check 1218 was issued in payment the same day.
7. Purchase of supplies for stock, $125, voucher 896, terms 2/10, n/30.
8. The semimonthly summary of materials and supplies requisitioned from the stockroom shows: direct materials, $2,800; indirect materials, $480.
9. Supplies covered by voucher 896 are returned to the vendor as unsatisfactory; amount $25. The balance of the amount owed on voucher 896 is paid by check 1219, discount being taken.
10. A summary of materials returned to the stockroom shows: direct materials returned for credit, $150; indirect materials, $24.
11. Paid voucher 893 with check 1220.
12. Rent for month, $400, is paid; voucher 897, check 1221.
13. Depreciation of machinery and equipment for month, $800.
14. Insurance expired, $25.
15. Semimonthly payroll, $8,400, vouchered and paid; voucher 898; check 1222.
16. A summary of the month's payrolls shows: direct labor, $12,000; indirect labor, $4,400. Distribute the payroll.
17. Property taxes accrued for month, $90.
18. Power and light bill for $200 is vouchered; voucher 899.
19. The semimonthly summary of materials and supplies requisitioned from the stockroom shows: direct materials, $2,200; indirect materials, $350; supplies, $98.
20. Social security taxes accrued for month, $656.
21. Physical inventory of materials and supplies, $2,000; perpetual inventory records, $2,100.
22. Total amount of factory overhead applied to production by the overhead distribution rate, $8,000.
23. Transfer of goods completed during the month to finished goods; cost: material, $4,000; labor, $10,000; factory overhead expense, $6,666.67.
24. Summary of sales for the month: cash sales, $2,000; credit sales, $15,000; cost of sales, $12,000.

Problem 4

The Geyer Manufacturing Co. has a job order cost system but does not operate as a departmentalized organization. A single overhead expense distribution rate, computed in accordance with the direct labor-hour method, is used in costing production. No system of budgetary control is employed, and a separate overhead rate is computed at the end of each month.

The following schedule shows conditions of overhead expenses and production for the first 6 months of the year:

Month	Actual factory overhead expenses	Actual direct labor hours
January	$10,800	24,000
February	10,500	21,000
March	12,000	30,000
April	15,000	50,000
May	13,000	40,000
June	11,500	20,000

Assume that each month of the 6-month period a customer sent in an identical order requesting the production of 100 units of product X which required direct materials costing $800 and direct labor composed of 200 hr. @ 90¢ per hour.

a. Compute the overhead distribution rate for each month.

b. Prepare a schedule showing the total costs and unit costs of the job each month of the 6-month period.

c. Explain the advantages to the company of a system of budgetary control and the use of a predetermined normal overhead distribution rate.

Problem 5

The National Manufacturing Co. has a highly seasonal business with its production reaching the peak during April, May, and June. The company operates in connection with a plan of budgetary control and recently has had a job order cost system installed.

The following information was obtained from the overhead and production budgets for the year:

Month	Factory overhead expense	Direct labor cost	Direct labor hours	Machine hours
January	$2,200	$4,000	6,500	1,800
February	2,100	3,800	6,200	1,600
March	2,400	4,300	7,400	1,900
April	2,800	5,000	7,800	2,300
May	3,000	5,800	8,100	3,000
June	2,900	6,000	8,500	3,900
July	2,500	4,500	7,500	2,800
August	2,300	4,100	6,800	2,100
September	2,350	4,300	7,200	2,500
October	2,150	3,600	6,300	1,700
November	2,000	3,000	6,000	1,650
December	1,800	2,000	5,000	1,250

a. Prepare normal overhead distribution rates using three different bases or methods.

b. Prepare a schedule showing the application of each of the three rates to production order 981 which contains the following information: direct material cost, $42; direct labor cost, $36; direct labor hours, 40; and machine-hours, 20.

c. Advise management as to the most equitable overhead rate or rates giving your reasons.

Problem 6

The Reliable Construction Co. plans to submit a bid for the construction of a post office in Rockhill. Estimates of direct costs of completing the job are:

Direct materials	$20,000
Direct labor:	
10,000 hr. @ $0.50	5,000
8,000 hr. @ 1.20	9,600
2,000 hr. @ 1.00	2,000
1,000 hr. @ 1.50	1,500

In order to determine the overhead applicable to the job, it is necessary to revise the budgets of overhead expenses and production for the company for the year so as to include the job in prospect. The revised budget estimates for the year are as follows: overhead expense, $80,000; direct labor hours, 250,000; and direct labor payroll cost, $200,000.

a. Compute overhead distribution rates for the company by both the direct labor-hour and direct labor cost methods.

b. Determine the estimated cost of the proposed post office by each method.

c. Advise the management as to which method of determining the cost estimate is the most reliable, giving your reasons.

Problem 7

J. M. Morris operates a small shirt factory in which 29 men and women are employed. All except three of the workers, a foreman, a clerk, and a janitor, are paid strictly on a piece-rate basis. There are three levels of piece-rates. One group of rates is applied to skilled workers who have been employed by the company 2 years or more; a second class of rates is used for skilled workers who have been employed less than 2 years; and the third class of rates is applied to inexperienced, unskilled workers. In each of the three groups there is a marked difference in the number of units produced in an hour. The productivity of some workers is double that of others, but Mr. Morris is not disturbed by this fact because workers are paid according to their productivity. Production orders are costed for overhead by the direct labor cost method, and each order has an identical labor cost per unit when worked on by workers in the same piece-rate wage class.

Discuss the existing wage plan and the method of allocating overhead to production. Make what recommendations you consider necessary.

Problem 8

The Westport Manufacturing Co. manufactures specialized machine tools in accordance with special orders. The plant is not operated as a departmentalized organization. Budgets prepared for the year are as follows:

Estimated factory overhead expense	$ 60,000
Estimated direct labor-hours	100,000 hr.
Estimated direct labor payrolls	$120,000

Production order 1096 shows the following direct material and labor costs for a job completed today:

Material	$100
Labor:	
500 hr. @ $0.50	250
100 hr. @ $0.60	60
50 hr. @ $1.00	50
Total prime cost	$460

You are requested to compute the overhead distribution rate for the company by both the direct labor-hour method and the direct labor cost method; present a schedule showing the total cost of production order 1096 according to each of the two methods; and advise the manager as to which method is preferable, giving your reasons.

Problem 9

The Lehman Foundry operates as a single production department and processes jobs according to special order. The balance sheet of the company on Jan. 1, 19—, after a year of operation is as follows:

BALANCE SHEET OF LEHMAN FOUNDRY
Jan. 1, 19—

Assets			Liabilities and Capital	
Cash		$10,000	Accounts payable	$ 5,000
Accounts receivable	$8,000		Bank loan	10,000
Less: Reserve for bad debts	1,000	7,000	Capital stock	35,000
Materials and supplies		9,000	Surplus	2,600
Finished-goods inventory		4,000		
Machinery and equipment	25,000			
Less: Reserve for depreciation	2,400	22,600		
		$52,600		$52,600

The budget for the year shows a total estimate of $48,000 for overhead costs and 120,000 direct labor-hours of production. The following transactions occurred during January:

1. Materials and supplies purchased on account, $8,000.
2. Direct materials requisitioned for use in production, $4,500.
3. Supplies issued from the stockroom, $500.
4. Payroll vouchered and paid: direct labor, $2,500; indirect labor, $1,000.
5. Overhead expenses vouchered and paid: rent, $200; repairs, $50; utilities, $300.
6. Adjusting entries were made to recognize the following unrecorded expenses: depreciation of machinery and equipment, $200; taxes accrued, $150.
7. Direct labor hours applied to work in process during the month totaled 5,750.
8. All work completed during the month was transferred to finished stock.
9. Work in process inventory as of Jan. 31: materials, $500; labor, $300; overhead expense, $200.
10. Finished goods inventory as of Jan. 31, $2,000.
11. Selling price of goods sold during the month, $12,000. All sales were made on a cash basis.

12. The variance between actual and applied overhead was analyzed and found to be due to an incorrect overhead distribution rate.

a. Prepare journal entries to record the transactions of the month and to close the books as of Jan. 31.

b. Set up general ledger accounts and post all transactions.

Problem 10

The Great Northern Paper Box Co. has a job order cost accounting system and a system of budgetary control. The trial balance of the company on July 1, the beginning of the fiscal period, is as follows:

TRIAL BALANCE OF GREAT NORTHERN PAPER BOX CO., JULY 1, 19—

Accounts	Dr.	Cr.
Cash	$ 18,000	
Accounts receivable	25,000	
Notes receivable	10,000	
Materials (inventory)	30,500	
Finished goods (inventory)	4,000	
Machinery and equipment	60,000	
Reserve for depreciation		$ 20,000
Reserve for bad debts		1,500
Vouchers payable		6,500
Prepaid insurance	300	
Property taxes accrued		600
Social security taxes accrued		300
Capital stock		100,000
Surplus		18,900
Total	$147,800	$147,800

The budget of factory overhead expense for the fiscal year shows an estimated total expense of $72,000; the budget of production contains an estimate of 180,000 hr. of direct labor. A normal overhead distribution rate, computed by the direct labor-hour method, is used to apply overhead to production.

During July the following production orders were completed and the products transferred to finished goods:

Production order No.	Direct material cost	Direct labor cost	Direct labor hours
909	$ 500	$ 150	200
910	750	210	260
911	3,800	950	1,360
912	1,600	500	630
915	80	35	40
	$6,730	$1,845	2,490

Production order 913 was canceled because the work was spoiled. The order was charged with $125 of direct material and $90 of direct labor cost representing 90 hr. of direct labor to point of spoilage. Scrap value of material transferred to the stockroom from this order was $10.

Production order 914 remained uncompleted in process on July 31; direct material cost, $150; direct labor cost, $80, representing 100 hr. of direct labor.

The following transactions occurred during July:

1. Materials purchased on account, $3,200.
2. Materials returned from the stockroom to vendors, $75.
3. Direct materials requisitioned from the stockroom and charged to production orders, $7,005; indirect materials requisitioned, $80.
4. Payroll vouchered and paid for July, $2,465, distributed as follows: direct labor, $2,015; indirect labor, $450.
5. Depreciation of machinery and equipment, $200.
6. Social security taxes accrued, $96.60.
7. Property taxes accrued $100.
8. Insurance expired, $30.
9. Rent vouchered and paid, $200.
10. Selling expenses vouchered and paid, $600.
11. Administrative expenses vouchered and paid, $500.
12. Sales on account $10,000; cost of goods sold, $6,000.
13. Estimated losses on bad debts, 2 per cent of sales.

a. Prepare journal entries and ledger accounts to record all transactions for July.

b. Prepare a schedule showing the direct material, direct labor, and factory overhead cost of each production order completed, the order spoiled, and the order in process on July 31.

c. Assume that one-half of the factory overhead expense variance is attributed to the use of an incorrect overhead rate and the balance is due to seasonal conditions; prepare journal entries to dispose of the variance.

Problem 11

The Maxwell Machine Works uses a normal overhead distribution rate computed by the direct labor-hour method. On June 30, 19—, the Factory Overhead Expense account has a debit balance of $8,500 and the Applied Factory Overhead Expense account has a credit balance of $8,100.

a. How would you investigate the variance of $400 in order to determine the causes of its incurrence?

b. What reasons may be given for its existence?

c. What disposition should be made of a portion of, or all, the variance under each of the reasons given in *b*?

d. Prepare journal entries to show proper disposition of the variance under each of the conditions given in *b*.

CHAPTER XI

JOB ORDER COSTS: DEPARTMENTAL OVERHEAD RATES

Departmentalization as an Aid to Management.—Managers of progressive manufacturing enterprises have come to recognize the need of functional departmentalization and the value of accumulating costs by service and production departments or centers within their factories. The advantages of departmentalization include more minute division of labor and specialization of tasks, logical layout and flow of work, scientific selection of personnel, assignment of responsibility and authority, and establishment of operating standards of efficiency. A complete system of cost accounting, through the collection of cost data and the establishment of standards of efficiency for each department, is a definite aid in the use of each of these managerial efficiency devices.

In manufacturing divisions where job order cost systems are in use, the accumulation of overhead by both service and production departments has been undertaken. This has paved the way for the replacement of a single overhead distribution rate for the entire factory by a separate rate for each department, which permits the use of more scientific bases for the application of overhead costs to production. In most concerns conditions of production vary to such an extent from department to department that any one overhead distribution rate for the entire plant is ineffective. For example, Dept. Y may be a drilling department with 10 automatic drilling machines and 3 machine operators, while Dept X may be an assembly process, employing 12 highly paid, skilled workers. If a general overhead distribution rate based on the direct labor-hour method or direct labor cost method is in use, a small amount of overhead will be apportioned to the production passing through Dept. Y even though the overhead costs for this production center are large, depreciation alone being a sizable item. Large amounts of overhead will be applied to the production of Dept. X because direct labor constitutes the important element of the work. Obviously machine-hours is a better base for Dept. Y, while direct labor hours can be used satisfactorily for Dept. X. The use of separate bases for each division necessitates the accumulation of both overhead costs and production by departments or production centers. If distribution rates are to be employed daily, as the production progresses through the plant, they must be predetermined

rates computed before the beginning of the accounting period through the use of budgets.

Industrial executives, public accountants, and cost accounting technicians are advocating the use of predetermined, departmental overhead distribution rates, with such methods as direct labor-hours, machine-hours, and direct labor costs being given the most favorable consideration. More explicitly, these plans provide for the distribution of the factory overhead for each department to the production of that department by means of carefully computed predetermined rates which may be expressed as follows:

(1) $\dfrac{\text{Estimated overhead for Dept. X for budget period}}{\text{Estimated direct labor-hours for Dept. X for budget period}}$ = rate per direct labor-hour.

(2) $\dfrac{\text{Estimated overhead for Dept. Y for budget period}}{\text{Estimated machine-hours for Dept. Y for budget period}}$ = rate per machine-hour.

(3) $\dfrac{\text{Estimated overhead for Dept. Z for budget period}}{\text{Estimated direct labor cost for Dept. Z for budget period}}$ = rate per dollar of direct labor cost.

(4) $\dfrac{\text{Estimated overhead for Dept. O for budget period}}{\text{Estimated production in terms of units, pounds, etc., for Dept. O for budget period}}$ = rate per unit of production.

All these methods may be in use in any one factory; the existing conditions of production in each department determine the method to be employed.

Plan of Accounting When Departmental Rates Are Used.—In this type of cost system, as was the case in the simpler plan introduced in the previous chapter, direct materials and labor are charged to production as they are consumed. To facilitate a detailed analysis of costs, a Materials in Process account, a Labor in Process account, and a Factory Overhead Expense in Process account are maintained in the general ledger as controlling accounts for production orders which follow the actual production through manufacturing processes. Production orders should contain sections to show direct materials cost, direct labor cost, and the applied overhead cost for each productive department.

Direct materials are requisitioned from the stockrooms, and the requisitions are used as a basis for entries in the departmental sections of the production orders used on each job, while corresponding entries are made in the issued section of the stock ledger accounts. Periodically, direct material requisitions are summarized, the Materials in Process account is debited, and the Materials account is credited through the medium of a general journal entry.

Daily time tickets or time reports are used as a basis for entries for direct labor in the departmental sections in production orders. These daily reports are also used by the payroll department in the preparation of weekly payroll sheets. Periodically, the total direct labor consumed in production, as shown in the payroll analysis sheets, is journalized as a debit to the Labor in Process account and as a credit to the Payroll account.

It is in the designing of the overhead structure that the departmental plan differs to a marked degree from the one presented in the preceding chapter. Exhibit 37 illustrates a plan of job order cost accounting for manufacturing enterprises which employ predetermined, departmental overhead distribution rates. General ledger controlling accounts are shown above the horizontal line, and the subsidiary cost records that each account controls are presented below the line. The chart is explained in detail in the present chapter.

As a preface to a detailed explanation of departmental rates, the following outline is given of the general accounting procedures required: (1) preliminary to the beginning of the budget period, (2) during the accounting period, and (3) at the end of the accounting period. A discussion of each phase of the procedure follows the outline.

General Procedure Preliminary to the Beginning of the Budget Period:

a. The departmentalization of the factory into production and service centers according to production activities and services performed.

b. The preparation of production budgets containing estimates of the production for each department in terms of direct labor-hours, machine-hours, or direct labor cost.

c. The preparation of factory overhead budgets showing the estimated overhead of each class, such as depreciation, taxes, supplies, rent, and indirect labor.

d. The allocation of the estimated factory overhead costs to the service and production departments. This results in the reclassification of the estimated overhead costs by service and production departments.

e. The allocation of the total estimated service departments' costs to production departments. At this point all estimated overhead costs are classified by production departments.

f. The selection and determination of a suitable overhead distribution rate for each department to be used during the budget period.

General Procedure during the Accounting Period:

a. Daily, as production is completed in each department, the use of the distribution rate for that department to apply overhead to production orders.

b. The accumulation of actual overhead costs through the voucher register, or journal, and the entry of these costs in total in the Factory Overhead Expense account and in detail in primary standing orders.

General Procedure at the End of Each Month or Quarter:

a. The distribution of the factory overhead costs, which are summarized in the Factory Overhead Expense account and shown in detail in the primary standing

orders, to the service and production departments and to the secondary standing orders according to the responsibility of each department for the incurrence of the overhead.

b. The apportionment in turn of the overhead costs of the service departments to production departments in accordance with the service rendered, the transfer being made in detail in the secondary standing orders.

c. The comparison of actual overhead for each production department with the amount of overhead which has been applied to production during the period for each department and the determination of departmental variances.

d. The analysis and disposition of the departmental variances.

e. The revision of the budgets and of overhead distribution rates for the remaining periods of the fiscal year.

Departmentalization of the Factory.—Production in every well-organized factory of any size consists of a series of operations performed in departments or production centers. A production department or center from an administrative point of view consists of a designated area in the plant in which a convenient physical arrangement of machinery and workers and effective executive supervision are the prime considerations. From the point of view of cost control, the accumulation and distribution of factory overhead to production are the most important consideration; therefore similarity of machinery and processes or operations is the most important basis for a department or a production center. Each center becomes virtually a separate factory, an individual costing unit independent of other operations. The degree to which a factory may be divided into departments depends entirely upon how minute a plan of supervision and collection of cost data is necessary. The desire to limit the amount of clerical work and red tape will prevent departmentalization of a plant being carried to an extreme.

Departments should be divided into two classes, production centers and service centers. Production departments are centers where actual productive activities are performed. A battery of machines performing similar operations, an assembly process, an inspection process under the supervision of a foreman or job foreman, each may be classified as a production department. In some cases single machines or work benches may be designated as production departments. In any plant where production is done in an orderly and precise manner, it is possible and practical to establish production departments for the assignment of responsibility and for the accumulation of overhead.

In addition to production departments it is important for management to recognize the existence of service departments and to accumulate the costs of their maintenance. Certain departments, such as personnel, planning, maintenance, cost accounting, superintendence, stockrooms, and trucking, are accessory to production departments and are created to facilitate the manufacture of the products in the plant. Most of their

activities are performed along such definite lines that departmentalization is relatively easy.

Preparation of Budgets and the Classification of Estimated Overhead by Departments.—Although a number of types of budgets may be a requirement of the executive planning of the manufacturing operations of a concern, two classes of budgets, production and overhead budgets, are indispensable to the proper functioning of the system of predetermined overhead distribution.

The production budget should exhibit the estimated quantity of each type of product expected to be manufactured during the period. Supporting the budget there should be for each productive department a working schedule showing the estimate of production in terms of direct labor-hours, machine-hours, direct labor cost, or units of production, depending upon which basis best denotes the productive conditions in the department.

More complex problems arise in compiling the estimated overhead expenses for each production department. Such budgets as depreciation, taxes, insurance, and repairs show the estimated total expense for each class of property. The rent, telephone, telegraph, water, power, and travel budgets contain the estimated expense of each class for the plant as a whole and ordinarily do not show a classification of estimated expenses by departments. Budgets which show estimates of expenses classified by service and production departments are exemplified by the supplies budget and the indirect labor budget.

Before the estimated overhead for each production department can be ascertained, the estimates of overhead must be classified by service and production departments according to the responsibility of each department for the incurrence of each overhead expense. This procedure must be followed by the reclassification of the estimated overhead of service departments by production departments, so that the total estimates of factory overhead expenses are finally classified by production departments.

Since at the end of each budget period it is necessary to follow exactly the same process of closing the *actual* overhead expenses to service and production departments and in turn of apportioning service department costs to the production departments, it seems advantageous to carry through the classifications of both estimated and actual expenses on the same sheets, the standing orders. In Exhibit 37 the primary standing orders have Budget, Actual, and Variance columns for each month. After the estimated overhead expenses of each class have been allocated to service and production departments, the primary standing orders exhibit in the Budget columns the amount of each type of expense apportioned to each department. Next, it is necessary to reclassify the esti-

mated overhead expenses in the departmental standing orders, there being a standing order for each service and production department. The standing order for each service department shows at this point the estimated expenses of each class which it is forecast will be necessary to maintain the department during the period; the standing order for each production department exhibits the estimated overhead assigned to that department. To reach the final goal, which is the total estimated overhead for each production department, it is necessary in turn to apportion the estimated overhead expense of each service department to the production departments. The allocation necessitates the use of distribution bases which measure the service rendered by each service department to other service departments and to production departments. The distribution of the estimated costs of service departments to the departments served should commence with the department which serves other departments to the greatest extent and which receives the least service from others. This order of distribution should be followed until all the estimated service department costs are assigned to producing departments.

After the estimated service department expenses have been allocated to production departments and have been entered in the Budget column of the standing orders for production departments, each standing order exhibits estimated overhead expenses composed of expenses assigned directly to the department and the share of the estimated cost of each service department distributed to this department. The total of the estimated overhead for each production department is then available for use in computing the predetermined departmental overhead rate.

The estimated cost data presented in the Budget columns of the service and production departments' standing orders should be invaluable to management as a guide in the control of the variable overhead expenditures during the budget period. Each department executive should be supplied with a copy of the standing order, or with a budget showing the estimated expenses of each class, for the budget period for his department. The actual attainment of the budget for each department is the goal of both departmental and major executives.

Selection of Departmental Overhead Distribution Rates.—The next step in the development of the overhead distribution procedure is the computation of rates for each production department. The estimated overhead for each department is divided by a base such as the estimated direct labor-hours, machine-hours, direct labor cost, or production in terms of units for the department.

The departmental rates should be normal distribution rates. As was explained in the preceding chapter, overhead costs and production vary from month to month owing to seasonal conditions.

If the plant is properly departmentalized so that centers with similarity of machine or labor operations are designated as production departments, the selection of an overhead distribution rate for each production department is not a difficult problem. Two important considerations are equitableness and practicability of the method to be used.

If a production department is composed primarily of skilled workers who are paid on a straight-time basis with more than one rate of pay existing, the most equitable base for the distribution of overhead to the production of the department is direct labor-hours. Overhead expenses accrue on the basis of time and each worker consumes approximately equal amounts of service for which overhead expenses are incurred. The labor-hour method is the best representative of the time factor.

Similarly, if a department contains workers of varying speed and skill and a piece-rate system is used as a means of equalizing the productive activity of workers, the labor-hour rate is the most equitable method, because each worker, regardless of productive ability, enjoys an equal amount of plant facilities whose existence necessitates the incurrence of overhead costs.

If a single, uniform product is processed in a production department, regardless of whether the prime factor is skilled labor or machines, the number of units, in terms of products, tons, pounds, thousand feet, or gallons, constitutes the best method of overhead distribution. The overhead rate is an amount in dollars per unit.

Increasingly important as an overhead distribution basis is the number of machine-hours in a production department. The machine-hour method adheres to the principle of distributing overhead expense on the time factor. The method is used successfully in departments in which machines are the predominant production factor and in which depreciation, repairs, machine supplies, power, and other overhead expenses, incurred in the operation of the machines, are the most important elements of overhead cost in the department. The machine-hour method is not satisfactory when a production department contains a number of machines which vary in original cost, repairs, power consumption, and productivity. In such cases machine-hours as a time factor result in inequitable distribution of overhead to production orders. As a result departments which contain dissimilar machines should be further subdivided into machine centers. Instead of a single machine-hour rate for each department an overhead distribution rate is computed for each machine or for each group of machines of the same type.

Individual Machine-hour Rates.—Each machine, whether a mammoth draw press (the biggest machine in the automobile industry) or a comparatively small machine such as a stationary electric drill, may be designated as a cost center, and an overhead distribution rate may be

computed for the machine. If several machines of the same type are in use, the group or battery of machines may be specified as a cost center, and a rate can be calculated for the group.

The machine-hour rate is computed by dividing the estimate of the machine-center factory overhead for the budget period by the estimated number of hours which the production budget shows the machine or machines will be operated during the period. The estimate of overhead expenses requires minute budget procedure, since it entails the breakdown of the estimate of factory overhead by machine centers. Estimates of hours of machine operation are obtained by an analysis of the machine capacity and of the expected production as shown in the production budget.

During the accounting period individual machine-hour rates are used to apply overhead for each machine or group of machines to production orders for jobs processed. At the end of each period actual factory overhead expenses are distributed among cost centers, which are comprised of individual machines or groups of machines. The actual overhead for each machine center is compared with the amount of overhead applied to production for the center; the resulting variance should be analyzed and disposed of in the same manner as are other types of overhead variances.

Cost Controlling Accounts and Subsidiary Record Relationships.—The general plan of accounting described in the preceding chapter in connection with enterprises not departmentalized can be used in enterprises in which departmental overhead distribution rates are employed. The differences in the two systems arise in the treatment of factory overhead costs.

In designing an accounting procedure for factory overhead, it is essential to maintain records which will show the amount of factory overhead applied to the production processed in each production department; the actual factory overhead costs by type; the actual factory overhead assignable to each service and production department; and the variance between the applied and actual factory overhead for each production department.

If the enterprise is not divided into too numerous service and production departments, it is advantageous to follow the plan illustrated in the chart, Exhibit 37. An applied factory overhead account is maintained in the general ledger for each production department to accumulate the overhead applied to production orders passing through the particular production departments. A controlling account termed Factory Overhead Expense is used to summarize actual overhead incurred during the accounting period. The account is supported by a group of standing orders composed of an analysis sheet for each type of cost, classified by

service and production departments. A controlling account is maintained in the general ledger for each service and production department, while a standing order or analysis sheet for each department is used as a subsidiary record to show in detail the actual overhead required to maintain the department. A variance account for each production department is also carried in the general ledger to show the monthly variance between the actual and applied overhead for each production department.

In the present chapter the above plan of general ledger accounts is employed in explaining the accounting treatment for factory overhead, because it is a convenient method of showing clearly the accounting relationships involved. However, it should be emphasized that other plans of general ledger and subsidiary record relationships may be more advantageous in an individual enterprise. If there are more than 10 or 15 service and production departments, it would burden the general ledger unnecessarily to have one account for each service department and three accounts, *viz.*, an applied overhead account, an actual overhead account, and a variance account, for each production department.

Either of two alternatives may be adopted to relieve the general ledger of a large number of departmental accounts. In lieu of three accounts for each production department, a single overhead account, such as Factory Overhead Expense, Dept A, may be used for each production department. During the accounting period the account would be credited for the amount of overhead applied to the production of the department; at the end of the period the account would receive debits representing actual overhead allotted to the department; and the difference between the actual and applied overhead for the department would appear as a debit or credit balance in the department account. Thus only one account for each service and each production department would be necessary in the general ledger.

A second plan, which is practical in large enterprises with a large number of departments, requires the use of five controlling accounts in the general ledger to summarize factory overhead transactions. One account, termed Applied Factory Overhead Expense, can be used to summarize all of the overhead applied for production departments. A subsidiary record would be required to summarize the amount of overhead applied to the production of each production department. In the accumulation of actual factory overhead, controlling accounts, termed Factory Overhead Expense, Service Departments, and Production Departments, could be employed; the detail of accumulating actual factory overhead costs by type and of reclassifying the data by service and production departments could be shown in standing orders or analysis sheets, maintained for each type of cost and each department. A single

account, termed Factory Overhead Expense Variance, could be used to show the variance between actual and applied overhead, and this account would control a group of analysis sheets showing the amount of variance for each production department.

Accounting for Applied Departmental Overhead Distribution Rates.—During the budget period, as production is completed in each production department or machine center, production orders are used as a medium for the collection of direct materials cost, direct labor cost, and applied overhead for each production department. The predetermined overhead expense distribution rate for each production department is used to apply the estimated overhead to production orders immediately after the work is completed in the center. For example, if the method of overhead distribution for Dept. A is the direct labor-hour plan and the normal overhead rate is $0.50 per direct labor hour, a production order, which indicated that 10 hr. had been required to complete the work in Dept. A, will receive applied overhead of $5.

Production orders generally follow production from department to department. Thus it is advantageous to maintain an applied overhead expense analysis sheet for each department to accumulate the amount of overhead applied to production orders during the period. A form of applied overhead expense analysis sheet is suggested as Exhibit 38.

APPLIED OVERHEAD EXPENSE ANALYSIS SHEET No._____

Department_____ Department rate_____

Date	Production order No.	Hours of direct labor	Amount of applied overhead expense

Exhibit 38.

Once a month, or more frequently, the applied overhead expense analysis sheet for each production department is totaled and the following journal entry is made:

Factory Overhead Expense in Process.....xxx
Applied Overhead Expense, Dept. A.....xxx
Applied Overhead Expense, Dept. B.....xxx
Etc.

The Factory Overhead Expense in Process account, together with the Materials in Process and Labor in Process accounts, is credited, and the Finished Goods account is debited, for the total cost of jobs completed during the period. At the end of the month the balances remaining in the three work in process accounts should be equal to the total amount of direct materials, direct labor, and applied factory overhead charged to production orders which represent uncompleted jobs remaining in process.

The Applied Overhead Expense account for each production department has a credit balance until the end of the month, when it is closed into the Overhead Expense Variance account for the department in question, which makes possible a comparison between the actual and the applied overhead expense for the period.

Accumulation and Classification of Actual Overhead by Departments.—During the accounting period the actual overhead expenses for the factory are summarized in the Factory Overhead Expense account in the ledger and are shown in detail in the standing orders which support the controlling account. The accumulation of actual overhead expenses for factories operating as departmentalized organizations is identical with the accounting procedure described in the preceding chapter for enterprises not departmentalized, with the exception of a detailed classification of expenses by departments in the standing orders. It will be remembered that overhead vouchers are entered in the voucher register as a charge to Factory Overhead Expense in the column provided for that account; requisitions for supplies are summarized, and the total cost is charged to Factory Overhead Expense and credited to Materials; payrolls are analyzed, and a debit is made to Factory Overhead Expense and a credit to the Payroll account; and, at the end of the accounting period, adjusting journal entries are made charging Factory Overhead Expense and crediting such accounts as Reserve for Depreciation, Prepaid Insurance, and Accrued Taxes.

However, when service and production departments are used as costing units, the standing orders must be prepared so as to show an analysis of expenses in terms of departments.

Management should have available in the standing orders supporting the general ledger account, Factory Overhead Expense, the total amount of each class of expense and the classification of each expense by service departments and production departments. A standing order is required for each type of expense, such as supplies, indirect labor, rent, insurance, taxes, and depreciation. As a matter of convenience this group of

standing orders is termed "primary standing orders." A form of primary standing order is suggested as Exhibit 39.

This form of primary standing order contains columns for Budget and Variance in addition to an Actual column. The Budget column is added so that estimates of expenses which are contained in budgets of factory overhead can be inserted at the beginning of the budget period in order that actual and budget figures may appear in the same sheets and a variance for each expense and department will be available to management at the end of the period.

STANDING ORDER NO. 10 — Expense: Supplies

Departments	January			February			Total		
	Actual	Budget	Variance	Actual	Budget	Variance	Actual	Budget	Variance
Service departments:									
Planning									
Trucking									
Stockroom									
Payroll									
Superintendent's office									
Production departments:									
A									
B									
C									
D									
Total									

Exhibit 39.—Primary standing order for supplies.

Distribution of Factory Overhead to Departments.—The distribution of each overhead expense to service and production departments can be made in the primary standing orders at the end of the accounting period. A few expenses can be allotted directly to departments in accordance with the service rendered, but the majority must be allocated through the use of bases which are equitable and practical. Distribution bases for the allocation of overhead to service and production departments are listed in Exhibit 40.

After the distribution of the actual overhead expenses to the service and production departments has been completed, the primary standing orders show in the Actual columns the factory overhead classified by departments. The estimated overhead expenses of each class for the month, classified by departments, were recorded in the Budget columns of the primary standing orders at the beginning of the period, so that a detailed comparison may be made of the actual and estimated figures

EXHIBIT 40

DISTRIBUTION BASES FOR ALLOCATION OF BOTH ESTIMATED AND ACTUAL OVERHEAD TO SERVICE AND PRODUCTION DEPARTMENTS

Overhead Expense	*Bases of Distribution*
Electric power and light expense	A survey of the number, size, and hours of operation of electric lights, fans, power machinery, elevators for each department
Fuel	Charge directly to power plant or heating department on basis of estimated or actual fuel needed
Labor	Estimated or actual labor cost in each department
Materials and supplies	Estimated or actual costs of supplies requisitioned by each department
Liability and compensation insurance	Number of employees, or classification of employees according to risk or insurance rate for each department
Perishable tools	Estimated or actual cost of tools used by each department
Repairs	Estimated or actual repair costs in each department
Spoiled work	Estimated or actual spoiled work for each department
Telegraph expense	Estimated or actual telegraph charges to each department
Telephone expense	Number of telephones in each department
Water expense	Estimate of consumption in fountains, in washrooms, and by water-driven machinery in each department
Depreciation on building	Square feet or value of space occupied by each department
Depreciation on machinery and equipment	Valuation and rate of depreciation on the machinery and equipment in each department
Fire insurance on building	Square feet or value of space used by each department
Rent	Square feet or value of space used by each department
Taxes on building	Square feet or value of space used by each department
Taxes on equipment	Value of equipment in each department
Taxes on trucks	Charged directly to trucking department

for the month and the variances carried into the Variance columns may be noted.

Service and Production Department Costs.—Whether or not an account in the general ledger is maintained to show the total operating expenses of each service and production department depends entirely upon the number of such department accounts and upon the policy of the concern as to the accounts needed in the general ledger for control purposes. In the present explanation, it is assumed that there is an account in the general ledger for each service and production department.

A group of expense analysis sheets, termed secondary standing orders, are recommended as records subsidiary to the service and production department accounts in the general ledger. The secondary standing orders differ from the previously explained primary standing orders only in classifying overhead expenses. The primary standing orders consist of an expense analysis sheet for each type of overhead expense, showing the amount assignable to each service and production department. The secondary standing orders consist of an analysis sheet for each service and production department, showing the amount of each type of expense

STANDING ORDER No. 21							Service department: Planning		
Expenses	January			February			Total		
	Actual	Budget	Variance	Actual	Budget	Variance	Actual	Budget	Variance
Fixed:									
Taxes									
Rent									
Depreciation									
Variable:									
Indirect labor									
Indirect materials									
Apportioned department charges:									
Personnel									
Payroll									
Accounting									
Superintendent's office									
Building service									
Total									

Exhibit 41.—Secondary standing order for a service department.

STANDING ORDER No. 45							Production department: A		
Expenses	January			February			Total		
	Actual	Budget	Variance	Actual	Budget	Variance	Actual	Budget	Variance
Fixed:									
Taxes									
Rent									
Depreciation									
Variable:									
Power									
Indirect labor									
Indirect materials									
Service department charges:									
Personnel									
Planning									
Accounting									
Superintendent's office									
Building service									
Total									

Exhibit 42.—Secondary standing order for a production department.

charged to the department. The primary group classifies expenses by departments, but the secondary group reclassifies the same expenses in such a way as to show the list of all expenses for each department. The two forms of classification permit management to analyze overhead first by type of expense and second by each service and production department.

Exhibit 41 illustrates a secondary standing order for a service department; Exhibit 42 represents a secondary standing order for a production department.

It will be noted that the standing orders for service departments are identical with those for production departments with one exception. The standing orders for service departments receive apportioned charges from a few other service departments, but a share of each service department is charged to production departments. Thus, since the planning department receives service from such departments as personnel, payroll, building service and the superintendent's office, a portion of the cost of maintaining each of these departments is allocated to the planning department. In turn, when service departments are distributed to production departments, the apportioned-charges section of the production-department standing orders receives a share of each service department cost.

Transfer of Factory Overhead to Departments.—After all the actual overhead expenses have been accumulated and classified by service and production departments in the primary standing orders, the amounts apportioned to each department are transferred to the actual columns of the secondary standing orders. A journal entry debiting each service and production department and crediting the Factory Overhead Expense account is made in order to transfer all the actual overhead into the departmental accounts. At this point each department standing order lists the actual indirect labor, supplies, depreciation, taxes, rent, insurance, etc., assigned to the department. The estimated expenses were listed in the Budget columns of each departmental standing order at the beginning of the period, so that a comparison of the estimated and actual expenses can be made for each department, the variances being shown in the Variance columns. In the general ledger, the account for each department shows the total overhead expenses assigned to it.

The next step is the apportionment, in turn, of the overhead expenses of the service departments to other service departments' accounts and to the production departments' accounts. Bases which reflect the service performed for each production department must be selected to be used in the apportioning process. The same bases that were used before the beginning of the period to spread the estimated service-department costs to the production departments must be employed in this distribution. Bases of distribution are suggested in Exhibit 43.

EXHIBIT 43

BASES FOR THE DISTRIBUTION OF BOTH ESTIMATED AND ACTUAL SERVICE DEPARTMENT OVERHEAD COSTS TO OTHER SERVICE DEPARTMENTS AND PRODUCTION DEPARTMENTS

Service Departments	*Bases of Distribution*
Cost accounting department	Survey of amount of record keeping in terms of estimated or actual hours for each department
Employment department	Estimated or actual rate of labor turnover or number of employees in each department
Hospital	Number of employees in each department
House magazine	Number of employees in each department
Janitor service department	Square feet of floor space and window space in each department
Maintenance and repair department	Charge directly on the basis of the estimated or actual hours worked for each department
Pattern room	Estimated or actual time required for work of each department
Payroll department	Estimated or actual total labor-hours or number of employees in each department
Power plant—arbitrarily divided into:	
a. Steam	Flow meters in each department or estimated steam used by each department through a survey of diameter of supply pipes, etc.
b. Heat	Square feet of radiator surface in each department
c. Electric power	Estimated electricity, obtained by a survey of amount used by different classes of machines, elevators, lights, etc., in each department
d. Compressed air	Flow meters or estimated normal amount used by machines in each department
Printing department	Estimated or actual time required for the work of each department
Purchasing department	Charge directly to materials on the basis of the estimated or actual value of goods purchased, number of purchases, or volume of goods
Receiving department	Charge directly to materials on the basis of the estimated or actual tonnage and number of articles handled
Statistical department	Survey of normal amount of statistical work in terms of hours for each department
Stenographic department	Estimated or actual number of hours of service required by each department
Stockrooms	Estimated or actual number of requisitions, quantity, or value of materials required by each department
Superintendent's office	Estimated or actual total labor-hours in each department
Trucking department (inside of plant)	Estimated or actual units carried, tonnage, and trucking hours of service for each department
Welfare department	Number of employees in each department

The amount of each service department charge allocated to the production departments is recorded in the Actual columns of the secondary standing orders for the production departments, and a general ledger entry is made crediting the service departments' accounts and debiting the production departments' accounts for the total amount transferred. Thus all the actual overhead costs for the plant are apportioned to production departments. The standing order for each production department exhibits in detail both the estimated and actual overhead expenses. Any variances between the two sets of figures are entered in the Variance columns.

Analysis and Disposition of Departmental Variances.—At the end of each month, after the Factory Overhead Expense account has been closed into the service and production department accounts and, subsequently, the service departments' accounts have been closed into the production department accounts, all the actual factory overhead for the enterprise is shown as debits to the various production department accounts. When the departmental overhead distribution rates were applied to production orders during the accounting period, entries for the amount of applied expense were made in the applied expense analysis sheets for the various departments. Periodically the departmental sheets were totaled, and the amount of applied overhead expenses for various departments was entered as credits to the Applied Overhead Expense account for each production department, Factory Overhead Expense in Process being debited.

The actual overhead for each production department, recorded as a debit in the Factory Overhead Expense account for the department, is compared with the applied overhead expense, which is shown as a credit balance in the Applied Overhead Expense account for the department. The actual and applied factory overhead accounts for each department are closed into the variance account for the department; the resulting balance is the variance for the period.

The analysis of the variance follows the same procedure as is explained in the preceding chapter. The primary and secondary standing orders can be used to compare actual and budget figures to determine whether there was an error in estimating the factory overhead for production departments. The production budgets can be compared with actual production records in order to ascertain whether or not actual and budget estimates of production agree. Departmental variances can be disposed of according to the methods discussed in the preceding chapter.

Questions

1. Why is departmentalization of a business enterprise an important aid to cost and managerial control?

2. Outline a general plan of cost accounting for enterprises using predetermined departmental overhead distribution rates.

3. Discuss departmentalization of a factory. What types of departments are designated? What factors are considered in determining departmental lines?

4. Explain how estimates of overhead expenses are classified by service and production departments.

5. How are predetermined departmental overhead distribution rates computed? What conditions within a department warrant the use of direct labor-hours as a base? direct labor cost? machine-hours? What are individual machine-hour rates?

6. Describe the general ledger account and subsidiary record relationships which may exist in a departmentalized factory.

7. Explain the accounting procedure when departmental overhead rates are used to apply overhead to production.

8. Explain the accounting procedure involved in accumulating and classifying actual overhead expenses by service and production departments, indicating both the general ledger and subsidiary record entries.

9. Explain how service departments' costs are transferred to production departments' accounts and to standing orders.

10. Discuss briefly the analysis and disposition of departmental overhead variances.

Problem 1

The Marshall Machine Works has two production departments: the foundry and the machine shop. The company has been distributing factory overhead to production for both departments by the direct labor cost method.

Assume that you have explained to the manager that other methods would permit a more equitable distribution. To prove your point, use the company's budgets to compute rates by the direct labor cost method and one other method for each department. The budgets show for the year:

Department	Estimated overhead expense	Direct labor cost	Direct labor hours	Machine-hours
Foundry	$ 8,000	$40,000	50,000	
Machine shop	12,000	20,000	15,000	8,000

Next, apply the rates you derive for each department to production order 905 which contains the following information: direct material cost, $200; direct labor cost in foundry, 20 hr. at 60 cents per hour; in machine shop, 10 labor-hours at $1.20 per hour and 6 machine-hours.

Advise the manager as to the most equitable rate which should be used for each department, explaining your position.

Problem 2

The Supreme Quality Manufacturing Co. has a job order cost system and uses a classification of three production departments, coded as I, II, and III.

The company budgets for the fiscal year show the following information:

	Dept. I	Dept. II	Dept. III	Total
Estimated factory overhead expense....	$ 8,000	$ 9,000	$11,000	$ 28,000
Estimated direct labor cost.....	$10,000	$30,000	$40,000	$ 80,000
Estimated direct labor hours.....	15,000	60,000	50,000	125,000
Estimated machine-hours.....	8,000	3,000	5,500	16,500

a. Compute single overhead distribution rates for the company, using three different methods.

b. Present a schedule showing three different overhead rates for each department.

c. Present a schedule showing the cost of production order 1025:

(1) Using each of the three single rates computed for *a.*

(2) Using each of the three rates computed for each department for *b.*

Production order 1025 contains the following information:

	Dept. I	Dept. II	Dept. III
Direct material cost.....	$40	$10	
Direct labor cost.....	$60	$20	$ 90
Direct labor hours.....	75	20	150
Machine-hours.....	30	6	5

d. Under what circumstances is each overhead distribution rate used most satisfactorily? Discuss.

Problem 3

The Bayview Machine Shop has three production departments which may be designated as A, B, and C. Department A employs a single grade of workers who receive an hourly wage of $0.55; Dept. B is a machine center composed of five machines, similar in design, and represents a large original investment, heavy yearly repairs, and depreciation charges; while Dept. C is a finishing process requiring two classes of skilled labor, workmen in group X receiving $0.75 an hour and those in group Y being paid $1 an hour.

The overhead expense budget and production budget for the year are classified by production departments as follows:

	Dept. A	Dept. B	Dept. C	Total
Estimated overhead expense.....	$1,000	$3,000	$ 600	$4,600
Estimated direct labor hours.....	2,000	500	1,000	3,500
Estimated direct labor payrolls.....	$1,100	$ 500	$ 900	$2,500
Estimated machine-hours.....		1,000		1,000

a. You are requested to compute overhead distribution rates to be used during the budget period by the direct labor-hour method and the direct labor cost method for each of the three departments and, in addition, by the machine-hour method in Dept. B. Explain which method you recommend as the most equitable for each department, giving your reasons in each case.

b. Production order 10 is processed in each of the three departments. The direct charges to the order are as follows:

	Dept. A	Dept. B	Dept. C	Total
Material	$25.00	$5.00		$30.00
Labor:				
10 hr. @ $.55	5.50			
2 hr. @ $1.00		2.00		
4 hr., group X @ $.75			3.00	
6 hr., group Y @ $1.00			6.00	16.50
Machine-hours, Dept. B, 10 hr				
Prime cost	$30.50	$7.00	$9.00	$46.50

Complete the cost of order 10 using the overhead distribution rate for each department you consider to be the most equitable.

Problem 4

The Antique Furniture Co. manufactures reproductions of antique furniture. No service department designation exists, but the company maintains a departmental classification of production activities in the operation of a job order cost accounting system. The production departments are coded as A, B, C, D, and E.

The budget of factory overhead for the year, beginning, Jan. 1, 19—, shows the following:

Supplies	$ 4,000
Indirect labor	12,000
Depreciation of machinery and equipment	5,000
Property taxes	1,800
Social security taxes	2,000
Rent	2,200
Supervision salaries	8,000
Power and light	1,000
Insurance	400
Heat	600
Total estimated overhead expenses	$37,000

Additional information, available before the beginning of the fiscal period, is exhibited in the schedule shown at the top of page 227.

Estimated overhead at the beginning of the period and actual overhead at the end of the period are to be distributed to departments on the following bases: indirect labor by survey percentages; depreciation, property taxes, and insurance by cost of machinery and equipment; rent, power and light, and heat by floor space; social security taxes by direct labor cost; supervision salaries by direct labor hours.

In applying factory overhead to production the rates used in each department are computed on the following bases: Depts. A and C, direct labor hours; Depts. B and D, machine-hours; Dept E, direct labor cost.

Department	Estimated supplies	Cost of machinery and equipment	Floor space, square feet	Estimated direct labor cost	Estimated direct labor hours	Estimated machine-hours	Survey of service rendered, per cent
A	$ 200	$ 8,000	2,000	$ 4,000	6,000	4,200	15
B	1,500	12,000	3,500	6,000	8,000	4,400	25
C	600	5,000	1,000	3,000	6,000	3,800	10
D	1,000	15,000	8,000	10,000	12,000	5,000	30
E	700	10,000	15,500	9,000	8,000	6,600	20
Total..	$4,000	$50,000	30,000	$32,000	40,000	24,000	100

The following information relates to the yearly operation:

1. Beginning inventories, Jan. 1, 19—: materials, $10,000; finished goods, $4,000.
2. Purchases of materials vouchered and paid, $18,000.
3. Materials requisitioned from the stockroom: direct materials, $20,000; supplies $4,200 (Dept. B requisitioned $200 in excess of its budget allotment).
4. Payrolls vouchered and paid: direct labor, $34,000; indirect labor, $11,500; supervision salaries $8,000.
5. Depreciation of machinery and equipment, $5,000.
6. Other expenses vouchered and paid: property taxes, $1,975; social security taxes, $2,140; rent, $2,200; power and light $1,100; insurance, $400; heat, $550.
7. A summary of production orders completed during the year shows:

Department	Direct material cost	Direct labor cost	Direct labor hours	Machine-hours
A	$ 3,000	$ 4,100	6,200	4,400
B	4,500	5,800	8,400	4,600
C	1,800	3,200	7,300	4,000
D	5,000	10,500	13,500	5,200
E	5,700	10,400	9,600	6,800
Total.....	$20,000	$34,000	45,000	25,000

8. Finished goods inventory, Dec. 31, $6,000.
9. Sales during the year: on account, $20,000; cash, $100,000.

a. Compute the overhead distribution rate for each department.

b. Submit journal entries for transactions for the year and to close the books as of Dec. 31.

c. Present journal entries to dispose of variances.

Problem 5

The Model House Corp. manufactures ready-built houses of one-room, two-room, three-room, and four-room construction. The houses are built in sections ready for

assembly by the purchaser. The company employs a job order cost system because the houses are built in lots of 10, each lot varying in appearance and minor details. Frequently houses are built in accordance with the specifications of customers.

The company has four production departments: mill, cabinet, finishing, and painting; and three service departments: factory office, planning, and maintenance. Budgets for the fiscal year show:

Department	Estimated factory overhead expense	Estimated direct labor cost	Estimated direct labor hours	Estimated machine-hours	Floor space, square feet
Mill	$20,000	$30,000	25,000	40,000	8,000
Cabinet	8,000	15,000	20,000		4,000
Finishing	7,500	15,500	22,000		3,600
Painting	6,500	9,500	9,500		2,000
Factory office	8,500				800
Planning	4,500				600
Maintenance	3,000				1,000
Total	$58,000	$70,000	76,500	40,000	20,000

Both estimated and actual service department costs are to be distributed directly to production departments on the following bases: factory office, direct labor-hours; planning, equally; and maintenance, floor space.

Factory overhead distribution methods are as follows: mill, estimated machine-hours; cabinet and finishing departments, estimated direct labor hours; painting department, estimated direct labor cost.

The following table shows the actual expenses for January and the apportionment to departments:

Expense	Amount	Mill	Cabinet	Finishing	Painting	Factory office	Planning	Maintenance
Rent	$ 500	Floor space for all departments						
Taxes	300	50%	15%	12%	8%	5%	5%	5%
Depreciation	2,000	30%	20%	10%	15%	5%	8%	12%
Indirect material	400	$100	$ 50	$ 30	$120	$ 50	$ 30	$ 20
Power and light	200	$110	$ 30	$ 35	$ 15	$ 3	$ 2	$ 5
Heat	250	Floor space for all departments						
Insurance	40	50%	20%	10%	8%	7%	3%	2%
Repairs	80	$ 80						
Indirect labor	2,500	$700	$200	$225	$175	$900	$200	$100

Inventory reports show: inventories Jan. 1: materials, $6,000; finished goods, $5,000—inventories Jan. 31: materials, $8,000; finished goods, $4,000. Materials purchased during the month, $12,000.

Production orders put into process and completed during the month are summarized as follows:

Department	Direct material cost	Direct labor cost	Direct labor hours	Machine-hours
Mill	$6,000	$ 2,000	1,800	3,000
Cabinet	1,900	4,000	4,500	
Finishing	600	3,200	4,000	
Painting	1,100	2,800	2,800	
Total	$9,600	$12,000	13,100	3,000

It may be assumed that expenses incurred are vouchered and paid. Sales for cash during January, $35,000.

a. Prepare journal entries to record all transactions for January and to close the books on Jan. 31.

b. Set up general ledger accounts and post.

c. Explain what disposition should be made of factory overhead variances.

CHAPTER XII

JOB ORDER COSTS: STATEMENTS AND REPORTS

Financial Statements and Reports.—An indispensable part of any system of accounting is a program of monthly statements and reports to inform management of the current financial status of the company and of the progress made by, and the costs incurred for, each department and division. The number of statements and reports and their character differ according to the requirements of the management of each business enterprise. The following statements and supporting cost reports are commonly prepared each month:

1. *Balance Sheet* (Schedule A) supported by statements of
   - *a.* Materials Inventory (A-1)
   - *b.* Work in Process Inventories (A-2)
   - *c.* Finished Goods Inventories (A-3)
2. *Profit and Loss Statement* (Schedule B) supported by statements of
   - *a.* Manufacturing Costs (B-1)
   - *b.* Cost of Goods Sold (B-2)
   - *c.* Service Departments' Costs (B-3)
   - *d.* Actual and Applied Factory Overhead Expenses for Production Departments (B-4)
   - *e.* Analysis of Factory Overhead Expense Variances (B-5)
   - *f.* Spoiled and Defective Work (B-6)

A simple form is presented for each of the above schedules. Statements of selling expenses are exhibited in Chap. XVIII.

Balance Sheet and Supporting Schedules.—A balance sheet prepared for a manufacturing enterprise is similar in form and content to the balance sheets of concerns engaged in merchandising activities, with two exceptions: the former requires three inventory accounts, raw materials, work in process, and finished goods; the asset classification contains fixed asset accounts and reserve for depreciation accounts for machinery and equipment, factory buildings, and patents. A form of balance sheet for a manufacturing concern (Schedule A) is presented as Exhibit 44.

In preparation of the balance sheet, the assumption is made that a variance of $3,251 existed between the actual and the applied factory overhead for the period.[1] An analysis of the variance disclosed that

[1] See the Statement of Analysis of Factory Overhead Expense Variances, Exhibit 53, p. 238.

$1,200 of the amount was caused by seasonal conditions of production and factory overhead costs. This amount is shown in the balance sheet as a deferred charge, since it will be offset by counter-balancing conditions in subsequent months. It is assumed that the remaining variance balance of $2,051 was caused by the use of incorrect overhead distribution rates during the period. The rates were too low, which resulted in production orders for the period being costed incorrectly with applied factory overhead. The additions of $100 to Work in Process Inventory and $300

EXHIBIT 44

THE CONSOLIDATED MANUFACTURING CO.

Schedule A

BALANCE SHEET

Jan. 31, 19—

Assets

Current assets:			
Cash		$10,000	
Accounts receivable	$30,000		
Notes receivable	12,000		
Total receivables	$42,000		
Less: Reserve for bad debts	2,000	40,000	
Temporary investments		15,000	
Inventories:			
Raw materials (Schedule A-1)	$18,000		
Work in process (Schedule A-2)	$3,000		
Add: Factory overhead expense variance	100*	3,100	
Finished goods (Schedule A-3)	$9,000		
Add: Factory overhead expense variance	300*	9,300	30,400
Prepaid insurance		1,000	
Total current assets			$ 96,400
Fixed assets:			
Investments		$10,000	
Office equipment	$ 4,000		
Less: Reserve for depreciation	1,000	3,000	
Machinery and equipment	$25,000		
Less: Reserve for depreciation	6,000	19,000	
Factory building	$60,000		
Less: Reserve for depreciation	10,000	50,000	
Land		8,000	
Patents	$ 5,000		
Less: Reserve for amortization	1,000	4,000	
Total fixed assets			94,000
Deferred charges:			
Factory overhead expense variance	$ 1,200†		
Selling expense variance	800‡		
Administrative expense variance	200§		
Total deferred charges			2,200
Total assets			$192,600

Liabilities and Capital

Current liabilities:		
Accrued payroll	$ 750	
Accounts payable	18,000	
Notes payable	4,500	
Accrued taxes	3,250	
Dividends payable	10,000	
Total current liabilities		$ 36,500
Fixed liabilities:		
15-year 4% first mortgage bonds due 1955		30,000
Capital and surplus:		
Capital stock, common	$65,000	
Surplus—balance Jan. 1, 19—	$45,100	
Net profit for January	6,000	
Surplus—balance Jan. 31	51,100	
Reserve for new machinery and equipment	10,000	
Total capital and surplus		126,100
Total liabilities, capital and surplus		$192,600

* Factory overhead expense variance caused by use of incorrect overhead expense distribution rates.
† Factory overhead expense variance caused by seasonal conditions of overhead and production.
‡ See Chap. XIX for discussion of selling expense variances.
§ See Chap. XX for discussion of administrative expense variance.

to Finished Goods Inventory show the amount of the variance which should be added to inventories in order to correct production records. The balance of the variance, $1,651, is treated as an addition to Cost of

THE CONSOLIDATED MANUFACTURING CO.
Schedule A-1
STATEMENT OF MATERIALS INVENTORY
Jan. 31, 19__

Account No.	Description	Balance Jan. 1	Purchases January	Total	Issued		Balance Jan-31	Location
					Direct materials	Indirect materials		
109	Castings	$1,000	$3,000	$4,000	$3,500		$500	Stockroom A
		$1,000	$3,000	$4,000	$3,500		$500	

Exhibit 45.

THE CONSOLIDATED MANUFACTURING CO.

Schedule A-2

STATEMENT OF WORK IN PROCESS INVENTORIES

Jan. 31, 19__

Production order No.	Date started	Product and style	Quantity	Direct material cost	Direct labor cost	Applied factory overhead expense	Total cost to Jan. 31	Estimated cost to complete	Location, department
A-1067	Jan. 25	Motors—XY	20	$40	$16	$8	$64	$26	Assembly
				$40	$16	$8	$64	$26	

Exhibit 46.

THE CONSOLIDATED MANUFACTURING CO.

Schedule A-3

STATEMENT OF FINISHED GOODS INVENTORY

Jan. 31, 19__

Production order or account No.	Product	Quantity	Direct material cost	Direct labor cost	Applied factory overhead expense	Total cost	Special order or stock	Location
A-967	Motors	50	$150	$200	$100	$450	Stock	Stockroom T
			$150	$200	$100	$450		

Exhibit 47.

Goods Sold since production orders representing goods completed and sold during the period were not properly costed.

EXHIBIT 48
THE CONSOLIDATED MANUFACTURING CO.
Schedule B
CONDENSED PROFIT AND LOSS STATEMENT
Jan. 1 to Jan. 31, 19—

Net sales			$60,800
Less: Cost of goods sold (Schedule B-2)			45,000
Gross profit on sales			$15,800
Selling expenses		$6,000	
Administrative expenses		4,000	10,000
Net profit on sales			$ 5,800
Nonoperating income:			
Rent of warehouse		$ 200	
Interest and dividends		150	
		$ 350	
Nonoperating expenses:			
Interest paid	$100		
Insurance and taxes on warehouse	50	150	200
Net profit for January			$ 6,000

The balance sheet may be supported by many schedules such as Accounts Receivable, Notes Receivable, and Investments, but only schedules which are related to the cost records are suggested in this book. Materials Inventory, Schedule A-1, is presented as Exhibit 45; Work in Process Inventories, Schedule A-2, is shown as Exhibit 46; Finished Goods Inventory, Schedule A-3, is given as Exhibit 47.

EXHIBIT 49
THE CONSOLIDATED MANUFACTURING CO.
Schedule B-2
STATEMENT OF COST OF GOODS SOLD
Jan. 1 to Jan. 31, 19—

Inventory, finished goods, Jan. 1, 19—		$ 2,719
Add: Normal cost of goods manufactured (Schedule B-1)		51,581
Total cost of goods available for sale		54,300
Less: Inventory, finished goods, Jan. 31, 19—	$9,000	
Add: Factory overhead expense variance	300	9,300
Total normal cost of goods sold		$45,000

The Profit and Loss Statement and Supporting Schedules.—The Profit and Loss Statement, Schedule B, Exhibit 48, is a summary statement of operations which is supported by schedules showing in detail sales and costs by territories and divisions. In the present chapter a Statement of Manufacturing Costs, Schedule B-1, is shown as Exhibit 50; a Statement of Cost of Goods Sold, Schedule B-2, is presented as Exhibit

EXHIBIT 50

THE CONSOLIDATED MANUFACTURING CO.

Schedule B-1

STATEMENT OF MANUFACTURING COSTS

Jan. 1 to Jan. 31, 19—

Direct material cost			$13,000
Direct labor cost			15,000
Factory overhead expenses:			
Variable expenses:			
Indirect materials	$ 800		
Spoiled work	200		
Indirect labor	11,000		
Idle time	651		
Power	160		
Heat	40		
Light	70		
Water	50		
Telephone and telegraph	30	$13,001	
Fixed expenses:			
Taxes	$ 300		
Insurance, fire	30		
Insurance, compensation	100		
Depreciation, machinery and equipment	250		
Depreciation, building	200	880	
Total actual factory overhead		$13,881	
Less: Total factory overhead variance		3,251*	
Factory overhead applied to production			10,630
Total normal manufacturing cost			$38,630
Add: Work in process inventory, Jan. 1, 19—:			
Material		$ 6,000	
Labor		5,000	
Overhead		3,000	14,000
			$52,630
Less: Work in process inventory, Jan. 31, 19—:			
Material		$ 1,300	
Labor		1,100	
Overhead		600	
		$ 3,000	
Add: Factory overhead variance		100	3,100
			$49,530
Add: Factory overhead variance due to incorrect overhead rate			2,051†
Corrected total normal cost of goods manufactured			$51,581

* Total factory overhead variance from all causes.

† Factory overhead variance due to incorrect distribution rates: $300 applicable to finished goods, $1,651 to cost of goods sold, and $100 to work in process inventory.

EXHIBIT 51
THE CONSOLIDATED MANUFACTURING CO.
STATEMENT OF SERVICE DEPARTMENT COSTS
Jan. 1 to Jan. 31, 19—

Schedule B-3

Expenses	Planning department			Maintenance and repair department			Payroll and accounting department			Total		
	Actual	Budget	Variance	Actual	Budget	Variance	Actual	Budget	Variance	Actual	Budget	Variance
Indirect materials	$ 80	$ 50	$+ 30	$ 220	$ 145	$+ 75	$100	$ 75	$+ 25	$ 400	$ 270	$+130
Indirect labor	3,500	3,300	+200	1,000	825	+175	500	375	+125	5,000	4,500	+500
Heat	8	8		7	7		5	5		20	20	
Light	10	8	+ 2	12	10	+ 2	8	5	+ 3	30	23	+ 7
Water	5	5		10	10		5	5		20	20	
Telephone and telegraph	20	30	− 10	3	5	− 2	2	5	− 3	25	40	− 15
Taxes	10	10		60	60		30	30		100	100	
Insurance, fire	2	2		5	5		3	3		10	10	
Insurance, compensation	5	5		15	20	− 5	10	10		30	35	− 5
Depreciation, machinery and equipment	10	10		50	50		15	15		75	75	
Depreciation, building	12	12		30	30		8	8		50	50	
Total	$3,662	$3,440	$+222	$1,412	$1,167	$+245	$686	$536	$+150	$5,760	$5,143	$+617

EXHIBIT 52

THE CONSOLIDATED MANUFACTURING CO.

STATEMENT OF ACTUAL AND APPLIED FACTORY OVERHEAD EXPENSES FOR PRODUCTION DEPARTMENTS

Jan. 1 to Jan. 31, 19—

Schedule B-4

Expenses	Dept. A			Dept. B			Dept. C			Total		
	Actual	Budget	Variance	Actual	Budget	Variance	Actual	Budget	Variance	Actual	Budget	Variance
Indirect materials	$ 200.00	$ 225.00	$− 25.00	$ 150.00	$ 140.00	$+ 10.00	$ 50.00	$ 55.00	$− 5.00	$ 400.00	$ 420.00	$− 20.00
Spoiled work	75.00	60.00	+ 15.00	125.00	100.00	+ 25 00				200.00	160.00	+ 40.00
Indirect labor	3,200.00	2,850.00	+350.00	1,800.00	1,400.00	+400.00	1,000 00	800.00	+200.00	6,000.00	5,050.00	+ 950.00
Power	60.00	45.00	+ 15.00	75.00	65.00	+ 10.00	25.00	30.00	− 5.00	160.00	140.00	+ 20.00
Heat	5.00	5.00		7.00	7.00		8.00	8.00		20.00	20.00	
Light	10.00	10.00		15.00	10.00	+ 5.00	15.00	12.00	+ 3.00	40.00	32.00	+ 8.00
Water	10.00	8.00	+ 2.00	10.00	5.00	+ 5.00	10.00	12.00	− 2.00	30.00	25.00	+ 5.00
Telephone and telegraph	5.00	5.00								5.00	5.00	
Idle time	200.00	50.00	+150.00	300.00	110.00	+190.00	151.00	70.00	+ 81.00	651.00	230.00	+ 421.00
Taxes	75.00	75.00		75.00	75.00		50.00	50.00		200.00	200.00	
Insurance, fire	8.00	8.00		7.00	7.00		5.00	5 00		20.00	20 00	
Insurance, compensation	25.00	15.00	+ 10.00	30.00	25.00	+ 5.00	15.00	20.00	− 5.00	70.00	60.00	+ 10.00
Depreciation of machines and equipment	75.00	75.00		60.00	60.00		40.00	40.00		175.00	175.00	
Depreciation of building	60.00	60.00		50.00	50.00		40.00	40.00		150.00	150.00	
Apportioned service department charges:												
Planning	1,831.00	1,720.00	+111.00	1,098.60	1,032.00	+ 66.60	732.40	688.00	+ 44.40	3,662.00	3,440.00	+ 222.00
Maintenance and repairs	564.80	466.80	+ 98.00	706.00	583.50	+122.50	141.20	116.70	+ 24.50	1,412.00	1,167.00	+ 245.00
Payroll and accounting	274.40	214.40	+ 60.00	274.40	214 40	+ 60.00	137 20	107.20	+ 30.00	686 00	536.00	+ 150.00
Total actual expense	$6,678 20	$5,892.20	$+786.00	$4,783.00	$3,883.90	$+899.10	$2,419 80	$2,053.90	$+365.90	$13,881 00	$11,830.00	$+2,051.00
Applied factory overhead expenses	$5,315.00			$3,250.00			$2,065.00			$10,630.00		
Variance	$1,363.20			$1,533.00			$ 354.80			$ 3,251.00		

EXHIBIT 53
THE CONSOLIDATED MANUFACTURING CO.

Schedule B-5

STATEMENT OF ANALYSIS OF FACTORY OVERHEAD EXPENSE VARIANCES
Jan. 31, 19—

Production department	Variance due to seasonal conditions: deferred item		Variance due to incorrect overhead distribution rate						Total variance
			Work in process inventory		Finished goods inventory		Cost of goods sold		
	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
A	$ 450.00		$ 42.00		$ 95.00		$ 776.20		$1,363.20
B	600.00		35.00		120.00		778.00		1,533.00
C	150.00		23.00		85.00		96.80		354.80
	$1,200.00		$100.00		$300.00		$1,651.00		$3,251.00

THE CONSOLIDATED MANUFACTURING CO.

Schedule B-6

STATEMENT OF SPOILED AND DEFECTIVE WORK
Jan. 1 to Jan. 31, 19__

Production department A

Production order No.	Product		Direct material cost	Direct labor cost	Applied factory overhead expense	Total cost to point of spoilage	Materials scrap value	Value as "seconds"	Net loss on job	Cause of spoilage
	Type	Quantity								
10951	MT	10	$10	$8	$6	$24	$4		$20	Carelessness
			$10	$8	$6	$24	$4		$20	

Exhibit 54.

49; a Statement of Service Department Costs (Schedule B-3) is shown as Exhibit 51; a Statement of Actual and Applied Factory Overhead for production departments, Schedule B-4, is given as Exhibit 52; a Statement of Analysis of Factory Overhead Variances, Schedule B-5, as Exhibit 53; and a Statement of Spoiled and Defective Work, Schedule B-6, as Exhibit 54.

The Statement of Manufacturing Costs and the Statement of Cost of Goods Sold are frequently combined as a single statement termed Cost to Manufacture and Cost of Goods Sold.

Problem 1

Refer to Prob. 9, Chap. X. Using the information given for the Lehman Foundry, prepare:

a. A statement of manufacturing costs for January.
b. A statement of cost of goods sold for January.
c. A balance sheet as of Jan. 31.

Problem 2

Refer to Prob. 10, Chap. X. Using the information given for the Great Northern Paper Box Co., prepare:

a. A statement of manufacturing costs for July.
b. A statement of cost of goods sold for July.
c. A condensed profit and loss statement.
d. A balance sheet as of July 31.

Problem 3

Refer to Prob. 4, Chap. XI. Using the information given for the Antique Furniture Co., submit:

a. A statement of manufacturing costs for the year.
b. A statement of cost of goods sold for the year.

Problem 4

Refer to Prob. 5, Chap. XI. Using the information given for the Model House Corp., submit:

a. A statement of manufacturing costs for January.
b. A statement of cost of goods sold for January.

Problem 5

The Atlas Manufacturing Co. began operations Jan. 1, 19—. It employs a job order cost accounting system in costing its production which consists of special orders received from other manufacturing concerns. The balance sheet of the enterprise on Jan. 1, was as follows:

ATLAS MANUFACTURING COMPANY
BALANCE SHEET
Jan. 1, 19—

Cash	$ 10,000	Accounts payable	$ 15,000
Raw materials inventory	20,000	Bank loan	20,000
Machinery and equipment	40,000	Capital stock	65,000
Building	22,000		
Patents	8,000		
	$100,000		$100,000

There are two production departments; Dept. X is composed primarily of labor operations by highly skilled and highly paid workers; Dept. Y is composed primarily of machine operations.

The budget information for January used in computing overhead rates for the distribution of factory overhead to production is as follows:

	Dept. X	Dept. Y	Total
Estimated factory overhead expense	$2,000	$3,000	$5,000
Estimated direct labor hours	4,000	500	4,500
Estimated machine-hours	400	1,500	1,900

The following transactions occurred during the month of January:

1. Purchases of materials and supplies on account, $15,000.
2. Total payrolls vouchered and paid: direct labor, $4,800; wages and salaries of clerks, helpers, and executives, $2,000.
3. Factory overhead expenses vouchered and paid: repairs, $200; power and light, $400; telephone and telegraph, $50; water, $25; and trucking, $75.
4. Factory overhead expenses recognized through adjusting journal entries: depreciation of machinery, $1,000; depreciation of building, $100; taxes, $200; insurance, $50.
5. Direct materials requisitioned and charged to production orders, $25,000; indirect materials used during the month, $600.
6. Direct labor hours and machine-hours, incurred for completed production orders 1 to 20, were as follows:

	Dept. X	Dept. Y	Total
Actual direct labor hours	3,800	520	4,320
Actual machine-hours	380	1,700	2,080

7. Production completed during the month consisted of production orders 1 to 20. Production order 21, remaining uncompleted in Dept. X, the first department, shows direct materials totaling $1,200; 400 direct labor-hours; and direct labor cost, $400.
8. Actual factory overhead expenses, totaling $4,700, were apportioned directly and by distribution bases to production departments as follows: Dept. X, $1,900; and Dept. Y, $2,800.
9. All work completed during the period, except production order 20 which shows a cost of $3,500, was sold for cash for $35,000.

10. An analysis of the variances between actual and applied factory overhead expense discloses that they were caused by the use of incorrect distribution rates.

Required:

a. Journal entries to record the month's transactions.

b. General ledger accounts.

c. Journal entry to dispose of departmental variances between actual and applied factory overhead expenses.

d. A statement of manufacturing costs for January.

e. A statement of cost of goods sold for January.

f. A balance sheet as of Jan. 31.

Problem 6

The Metropolitan Manufacturing Co. prepares its budgets and closes its books for a 6-month period which is considered a normal period of operation. On Jan. 1, the general ledger of the company contained the following open accounts:

Accounts	Dr.	Cr.
Cash	$ 8,000	
Accounts receivable	15,000	
Reserve for bad debts		$ 3,000
Materials	14,000	
Materials in process	3,000	
Labor in process	2,000	
Factory overhead expense in process	1,000	
Finished goods	7,000	
Machinery and equipment	20,000	
Reserve for depreciation of machinery and equipment		5,000
Bonds payable		7,000
Capital stock		50,000
Surplus		5,000
Total	$70,000	$70,000

Transactions from Jan. 1, to July 1, may be summarized as follows:

1. Purchases vouchered and paid, $24,000.

2. Materials requisitioned from stockroom: direct materials, $20,000; indirect materials, $6,000.

3. Payrolls vouchered and paid: direct labor, $40,000; indirect labor, $10,000.

4. Factory overhead expenses vouchered and paid: rent, $2,400; insurance, $150; repairs, $250; social security taxes, $200.

5. Adjusting entries were made as follows: depreciation of machinery and equipment, $1,000; taxes accrued, $500.

6. Producing departments were charged with factory overhead expenses as follows:

Department		Department	
1	$4,500	3	$5,400
2	3,600	4	7,000

7. Factory overhead was applied to production by means of predetermined overhead distribution rates as follows:

Department		Department	
1	$4,200	3	$5,800
2	3,300	4	6,700

8. The cost of production orders completed and transferred to finished stock is as follows:

Direct material	$18,000
Direct labor	35,000
Factory overhead	17,500

9. Sales for cash, $100,000; cost of goods sold, $70,000.
10. Selling expenses vouchered and paid, $8,000.
11. Administrative expenses vouchered and paid, $12,000.
12. Cash received from rent of office space to other concerns, $900.
13. Interest paid on bonds, $300 (considered a nonoperating expense).
14. Variances between actual and applied factory overhead are the result of the use of incorrect overhead distribution rates.

a. Prepare journal entries to record all transactions for the 6-month period.
b. Open general ledger accounts and post.
c. Submit the following statements: a condensed profit and loss statement, a statement of manufacturing costs, a statement of cost of goods sold, a statement of actual and applied factory overhead for production departments, and a balance sheet.

CHAPTER XIII

PROCESS COST ACCOUNTING

Types of Industry Using Process Costs.—Process cost accounting may be used successfully in plants producing standard products which are intermingled in such a manner that lots are not distinguishable. The following conditions are favorable for the use of process cost accounting principles:

a. Production of a single product in a plant.

b. Division of a plant into processes or departments, each responsible for the manufacture of a single product.

c. Processing a single product for a scheduled time, followed by successive runs of other products, each run being separated as to production and costs.

d. Production of several products of standard design in the same plant, process, or department under conditions which permit computation of weighted averages to denote relative importance of each product as to quantities and costs.

e. Division of a factory into separate operation or production centers, each performing standard operations.

If many different commodities are produced in the same process, there is difficulty in allocating costs to each product. Thus, if a single department of a furniture factory produces office furniture, including desks, chairs, and bookcases of varying sizes and designs, an average cost per unit is unsatisfactory, since unlike products are being averaged. Plants fabricating a single product, or so departmentalized that each department produces a single product, are best adapted to the use of the process cost system. Plants producing electric power, paper, rubber products, bread, candy, steel products, medicines, and chemical products can use process cost systems advantageously.

Another type of enterprise to which process cost accounting is well adapted includes concerns such as flour mills, bottling companies, canning plants, bakeries, breweries, and some steel and heavy manufacturing concerns which schedule work so as to produce different products in the same process, each product having a separate run. A canning plant may process one vegetable continuously for several days or weeks, other vegetables being processed at allotted times. A bottling company may schedule the processing of a certain formula for a day, preparing a different drink each successive day of a week. When the same machine and equipment are used for processing different products successively, it is

necessary to keep a record of production and of costs for each scheduled run. Material and labor can be computed for each run, but overhead expenses must be allocated by equitable distribution bases, the time element in terms of hours of operation being a primary consideration.

In a few industries, such as foundries, machine shops, mattress factories, and laundries, it is possible to fabricate several unlike products simultaneously in the same process or department and to obtain reasonably accurate costs through the use of weighted averages. The success of this mode of costing depends upon the accuracy with which weights, denoting the relative importance regarding cost conditions, can be assigned to each product. The fewer the number of products flowing through a process, the more successfully the cost plan can be operated.

Another group of concerns is typified by the refining of oil, processing of by-products in packing plants, and the manufacture in mass-production plants of parts for automobiles, typewriters, electrical equipment, and products mechanical in nature. A large number of operations are needed to produce a single part or product, and many thousands of like units may flow through a single operation. The operation cost method, which is a refinement of process cost accounting, may be used in plants of this type.

General Principles.—Process cost accounting is predicated on the theory that average costs are typical of operating conditions of production and that average costs are of primary interest to management. The general principles of process cost accounting may be outlined as follows:

a. Costs, both direct and indirect, are accumulated in expense accounts during the period and are reclassified by departments or processes at the end of the period.

b. Production in terms of quantities such as units, tons, pounds, feet, and gallons are recorded by processes daily or weekly and are summarized in departmental reports at the end of the period.

c. The total cost of each process is divided by the total production for the process to obtain an average cost per unit for the period.

d. When products remain in process at the end of a period, production and inventories are computed in terms of completed products, the stage of completion usually being estimated and the identity of each lot being ignored.

e. If units are lost or spoiled in a department, the loss is borne by the units completed and remaining within the department, thus increasing the average cost per unit.

f. In cases where products are processed in more than one department, costs of one department are transferred to the next department, the total cost and unit cost of products being accumulated when completed.

Departmentalization.—The proper classification of production activities of a factory by departments or processes is one of the most important steps in the operation of a process cost system. The factory may be divided into processes which include relatively large spheres of activity, or into operations or "cost centers" which are limited to a single operation or type of work. The process or department usually includes a number of

operations, none of which is separately measurable and each of which completes a distinct stage in the manufacture of the product. The boundaries of the process are determined by (*a*) jurisdiction or supervision, (*b*) similarity of work performed, and (*c*) physical location of men and machines in the plant.

A supervisor or foreman is given jurisdiction over a process, which may be a battery of machines, a group of workmen performing similar operations, or a combination of men and machines responsible for the completion of a distinct stage in the production of the product. While not essential, proper supervision and production record keeping are facilitated by the physical grouping of men and machines constituting a process. The terms "process" and "department" are used interchangeably in later discussions of process cost accounting.

Accounting for Materials.—The material accounting procedure during each accounting period involves the use of the general accounting system with its regular accounting ledgers and records of original entry. Materials and supplies are vouchered from such supporting business papers as purchase orders, invoices, and receiving reports, and the amount of the purchase is entered in the voucher register or purchase journal as a debit to a Materials controlling account. It is customary to have a subsidiary stock ledger in support of the Materials controlling account, and each purchase is recorded in accounts in the stock ledger while the physical materials are placed under the control of stockkeepers.

Materials and supplies are issued from stockrooms upon written requisitions prepared by supervisors in charge of processes. The requisitions are prepared in duplicate; the original is kept by the stockkeeper, and the second copy is filed in the process receiving the material. At the end of each accounting period requisitions are sorted by processes, and the quantities issued from stockrooms can be checked with quantities received by processes. A summary report of quantities and value of material issued to processes during the period provides the basis for a general journal entry debiting each process account and crediting the Materials controlling account.

Accounting for Labor and Supervision.—In accounting for labor the important consideration is the identification of each worker with the processes benefiting from his labor. Daily time reports are prepared to show all employees engaged in production in each process; transfer forms are used to record hours of work for workers who divide their time among processes. At the end of each accounting period daily time reports are summarized in a report of labor costs for each process, which is used as a basis for the journal entry debiting each process and crediting the factory Payroll account. The Payroll account is debited in the voucher register when payroll vouchers are prepared.

A more difficult problem arises in connection with the distribution to processes of payrolls of clerical and supervisory employees who cannot be identified with a single process. The same general ledger payroll account may be used in recording this class of labor, or a separate payroll account, Clerical and Supervisory Salaries, may be set up in the general ledger. Since the work done by this class of employees aids production indirectly, a distribution base which will apportion the total indirect payroll expense to processes in an equitable manner must be selected. Circumstances will vary with each concern, but any of the following bases may be used: production in terms of units in each process, labor-hours of workers identified with each process, labor cost or total payrolls for each process, or estimate of work done by clerical and supervisory staff for processes. The last base would necessitate the making of a careful survey of the services performed for each process, taking into consideration record keeping, production planning, and supervision.

Accounting for Overhead Costs.—In addition to materials, supplies, and payrolls, there are a number of other costs, usually termed "overhead costs," which must be distributed to process accounts in order to obtain the total costs of operating each process during the period.

One of two methods may be employed by the general accountant in recording these costs during the accounting period. A general ledger controlling account, termed Factory Overhead Expense, and a subsidiary ledger with an account or analysis sheet for each cost may be used, or a separate account for each cost may be carried in the general ledger.

Costs such as rent, telephone and telegraph, water, gas, power and light, and repairs are vouchered during the accounting period and are entered in the voucher register or cash disbursement journal as a charge to the general ledger controlling account, Factory Overhead Expense, or are charged to separate accounts in the general ledger. Cost items such as depreciation on building and equipment, taxes, insurance, and fuel are set up at the end of the period through the media of adjusting entries. The controlling account, Factory Overhead Expense, or a separate Depreciation account is charged and Reserve for Depreciation is credited for estimated depreciation. A debit is made to the controlling account, Factory Overhead Expense, or to separate insurance expense accounts, and credits are made to the Prepaid Insurance account for the amount of insurance which has expired during the period. Taxes are typical of accrued expenses which require entries debiting expense accounts and crediting current liability accounts such as Accrued Taxes Payable.

A few of the factory overhead costs can be apportioned directly to process accounts at the end of the accounting period, but in most cases distribution bases must be selected so as to make possible an equitable

allocation. While existing conditions of operation within a factory will prevent the use of arbitrary bases, a list of suggested bases is given below.

Factory Overhead Expense	Bases of Distribution to Processes
Purchased light and power	Meter readings; survey of number, size, and hours of operation of lights, fans, power machinery
Rent	Floor space occupied by each process
Fuel: gas, oil, and coal	Estimated or actual quantities used in each process
Fire Insurance	Valuation of equipment and risk
Compensation insurance	Number of employees in each process
Repairs	Actual repair costs in each process
Telephone expense	Number of telephones in each process
Water expense	Meter readings; estimate of amount used in each process
Depreciation of building	Floor space occupied by each process
Depreciation of machinery and equipment	Valuation and rate of depreciation on machinery and equipment in each process
Taxes on building	Floor space occupied by each process
Taxes on equipment	Value of equipment in each process
Unemployment compensation taxes	Amount of payroll for each process

After the proper bases of distribution have been determined and the amount of each expense to be allocated to each process has been computed, an entry is made debiting each process and crediting the controlling account, Factory Overhead Expense, or each expense account if separate expense accounts appear in the general ledger.

In some concerns no attempt is made to distribute each factory overhead expense separately to processes. The total of factory overhead expenses for the period is allocated in a lump sum to processes upon a blanket distribution base, such as total production or total hours of work in each process for the period. Such a method is less scientific and may result in grossly inaccurate unit costs.

Production Records.—During the accounting period, daily production records are prepared for each process. Meter readings may be used in some processes to account for production, the meters on machines being read at the beginning and end of each day or run. In plants using piece-rate wage systems, finished units are counted by timekeepers or inspectors. Daily reports of production for each process are summarized to constitute a monthly or end-of-the-period production report.

Transferred Costs.—The total costs of each process, which include material, labor, and distributed amounts of each factory overhead expense, are divided by the production of each process as gathered from production reports. The labor and factory overhead expense are termed

the "conversion costs," which, together with material costs, form the total cost of the product finished in one process to be transferred to the next process. The costs are accumulated from process to process, both as to total costs and as to costs per unit, until the final transfer is made crediting the last process and debiting the Finished Goods account. Finished

EXHIBIT 55
EASI-REST MATTRESS CO.
ANALYSIS OF COST OF PRODUCTION
Jan. 1 to Feb. 1, 19—

Production expenses	Sewing room		Blowing		Tufting and finishing		Inspection and wrapping		Total cost	
	Cost	Cost per unit	Cost	Cost per unit	Cost	Cost per unit	Cost	Cost per unit	Cost	Cost per unit
Materials:										
Ticking	$ 750	$0.75							$ 750	$0 75
Cotton			$4,000	$4.00					4,000	4 00
Thread	30	0.03			$ 20	$0 02			50	0.05
Twine					60	0 06			60	0.06
Miscellaneous supplies	5	0.005	10	0.01	15	0 015	$ 20	$0 02	50	0 05
Mattress bags							60	0 06	60	0.06
Total material cost	$ 785	$0.785	$4,010	$4.01	$ 95	$0.095	$ 80	$0.08	$4,970	$4.97
Labor:										
Direct labor payroll	500	0 50	200	0.20	1,000	1 00	150	0 15	1,850	1.85
Clerical payroll	50	0.05	40	0.04	60	0 06	30	0 03	180	0.18
Supervision and executive payroll	100	0.10	80	0 08	150	0 15	70	0 07	400	0 40
Total payroll cost	$ 650	$0.65	$ 320	$0.32	$1,210	$1.21	$250	$0 25	$2,430	$2 43
Factory overhead expense:										
Rent	50	0.05	40	0.04	100	0.10	10	0 01	200	0.20
Depreciation of equipment	25	0.025	60	0.06	10	0.01	5	0 005	100	0.10
Storage	10	0 01					20	0.02	30	0 03
Power and light	15	0.015	25	0.025	5	0 005	5	0 005	50	0.05
Telephone and telegraph	3	0.003	3	0 003	3	0 003	3	0.003	12	0.012
Insurance	5	0 005	15	0 015	5	0 005	3	0 003	28	0.028
Taxes	5	0.005	10	0 01	3	0.003	2	0 002	20	0 02
Repairs	10	0 01	25	0 025					35	0 035
Miscellaneous factory expenses	15	0 015	10	0 01	4	0 004	1	0 001	30	0 03
Total factory expenses	$ 138	$0.138	$ 188	$0.188	$ 130	$0 13	$ 49	$0 049	$ 505	$0.505
Total costs	$1,573	$1.573	$4,518	$4.518	$1,435	$1.435	$379	$0 379	$7,905	$7.905

Number of mattresses completed during January—1,000.

Goods generally is a controlling account with a supporting subsidiary ledger in which are recorded both quantities and costs of finished stock received from production, sold, and on hand. Some products may be completed after going through one or two processes, in which case the costs of such products are transferred directly from the process completing the work to Finished Goods.

A summary report of goods sold during each period is used as a basis for the general journal entry debiting Cost of Goods Sold and crediting Finished Goods, using either the first-in, first-out method or an average method of computing costs if finished stock has been processed in more than one accounting period. At the end of each period the balance in the Cost of Goods Sold account is transferred to Profit and Loss.

Detailed Unit Costs Essential to Management.—Average costs per unit may be determined very simply by dividing the total monthly costs for a factory by the number of units produced during the period, but management is not supplied with detailed costs to aid in planning and controlling production. A mattress factory producing a single type of mattress may be used as an illustration. The average cost per mattress would not be sufficiently complete information unless it were supplemented by detailed costs per mattress for each item of expense for each process. The cost analysis sheet given below as Exhibit 55 shows the result of the distribution of costs to each process and the division of each item of cost for each process by the number of mattresses produced.

Detailed Costs by Successive "Runs."—A variation in the computation of detailed unit costs is existent in small plants and in processes in large factories which are subject to production of different products at scheduled periods of time, each product having a separate "run." The same labor personnel, machinery, and equipment are used for each run but, unless costs are computed separately for each product, no satisfactory units costs are available.

Concerns typifying this method of production are canning factories, flour mills, bottling works, bakeries, and chemical laboratories. Thus vegetable canning factories process asparagus, peas, beans, spinach, beets, tomatoes, and corn as each vegetable is in season. While each vegetable is prepared in a different manner, the general processing and equipment are the same. Each run has a definite schedule of hours or days, with an interval of time between the processing of each vegetable for cleaning equipment and preparing for the next run.

The general ledger journal entries are the same in this type of processing as in the procedure explained for a factory or process producing a single product in a continuous manner. Material, labor, and factory overhead expenses are charged to each process at the end of each accounting period. The difference lies in the use of subsidiary records. A separate analysis sheet is prepared for each run to show the material, labor, and factory costs which can be definitely identified with the vegetable being processed. Likewise the number of hours that the equipment is used for each vegetable and the total production of cans are carefully recorded. At the end of each accounting period labor costs and factory overhead expenses which cannot be identified with a separate run are

allotted to the production of each vegetable, usually on a single distribution base; the choice is among the total number of production hours for each vegetable, the total number of cans of each vegetable produced, and the number of pounds of each vegetable packed.

EXHIBIT 56
FULL-PACK CANNING FACTORY
ANALYSIS OF COST OF PRODUCTION
June 1 to July 1, 19—

Production expenses	Asparagus		Peas		Beans		Spinach		Total costs
	Cost	Cost per unit	Cost	Cost per unit	Cost	Cost per unit	Cost	Cost per unit	
Materials:									
Vegetables	$ 750 00	$0.05	$1,200.00	$0.03	$ 400.00	$0.02	$1,500.00	$0.03	$ 3,850.00
Cans and lids	325.50	0.0217	868.00	0.0217	434.00	0.0217	1,085.00	0.0217	2,712.50
Labels	13.50	0.0009	28.00	0.0007	14.00	0.0007	40 00	0.0008	95.50
Boxes	45.00	0.003	100.00	0.0025	50.00	0.0025	125.00	0 0025	320.00
Miscellaneous supplies	60 00	0 004	120 00	0 003	40 00	0.002	100 00	0.002	320 00
Total material costs	$1,194.00	$0.0796	$2,316.00	$0.0579	$ 938.00	$0.0469	$2,850.00	$0.057	$ 7,298.00
Labor:									
Direct labor payroll	$ 450.00	$0 03	$ 800.00	$0.02	$ 300.00	$0 015	$1,500.00	$0.03	$ 3,050.00
Supervision payrolls	150 00	0 01	200.00	0.005	100.00	0.005	500.00	0.01	950.00
Total payroll costs	$ 600.00	$0.04	$1,000.00	$0 025	$ 400.00	$0.02	$2,000.00	$0 04	$ 4,000.00
Factory overhead expenses	300 00	0 02	600 00	0 015	400.00	0.02	500 00	0.01	1,800 00
Total costs	$2,094.00	$0.1396	$3,916.00	$0.0979	$1,738.00	$0.0869	$5,350.00	$0.107	$13,098.00
Total production, No. 2 cans	15,000		40,000		20,000		50,000		125,000

The monthly report, Exhibit 56, exhibits an analysis of costs for vegetables canned for a monthly accounting period. Since No. 2 cans were the only size used, unit costs were computed on the basis of the number of cans produced. If vegetables had been packed in several different sized cans, the unit cost determination could have been made on the basis of the number of pounds packed.

SPECIAL CONSIDERATIONS IN DETERMINING UNIT COSTS

Processing of Two or More Products Simultaneously.—When two or more dissimilar products are manufactured in the same process, an average cost per unit obtained by dividing the total process costs by the number of units produced gives a cost figure which is not typical and, in some cases, entirely misleading.

Referring again to the Easi-Rest Mattress Co. cost statement on page 248, it may be assumed that three types of mattresses are manufactured. Since an average cost without regard to size and grade is unsatisfactory cost information, the company has several alternatives in planning pro-

duction and in determining costs. It may be advisable to use production orders under the job order type of cost system rather than attempting to compute costs by the process system. If the process cost system is used, production may be planned on a special-run basis, as has already been illustrated in the case of the Full-pack Canning Factory. Each size and grade of mattress can be processed and costed separately. If it is desirable to process two sizes and three grades simultaneously, another alternative would be to separate each process into operations, since the majority of operations would be uniform for each mattress but some models would require different or additional operations. The operation cost plan is explained in the next chapter.

Another alternative which employs the use of a simple statistical device has been found successful in some concerns. Before the accounting period begins, a study is made of production and costs of each type or style of product, and the relative importance of one as compared to others is indicated in terms of points which are used as a common denominator. The rating as to importance may differ from one process to another, or it may remain the same throughout the entire manufacturing process.

The Easi-Rest Mattress Co., illustrated on page 248, may be used to exemplify the method. It may be assumed that in the first process, the sewing room, an analysis of material, labor, and factory expense conditions results in the assignment of the following weighted averages:

Style X	5 points
Style Y	10 points
Style Z	15 points

Thus in the first process, material costs of ticking, costs of cutting, and costs of sewing are estimated to warrant giving Style Z an importance three times as great as that of Style X. The following schedule shows the weighted average production of 1,000 mattresses for a month:

Style	Production	Weighted average per unit	Total points
X	200	5	1,000
Y	500	10	5,000
Z	300	15	4,500
Total	1,000		10,500

The figure representing the total costs of the sewing room, $1,573, is divided by 10,500 points, resulting in a cost of $0.14981 per point.

Unit costs and total costs of production for the sewing room assigned to each style of mattress are as follows:

Style	Points	Cost per point	Cost per mattress	Production	Total cost
X	5	$0.14981	$0.74905	200	$ 149.81
Y	10	0.14981	1.4981	500	749.05
Z	15	0.14981	2.24715	300	674.14
Total.....				1,000	$1,573.00

In the case of a mattress factory a separate schedule of weighted averages should be prepared for each process since conditions of production and costs vary. The same procedure would be followed for other processes and, at the end of each period, the cost report would exhibit unit and total costs in each process and accumulated unit and total costs for each style of mattress.

The success of a system of computing costs by using weighted average production is dependent entirely upon the accuracy with which relative weights or importance are assigned to products. Obviously, if an importance of 2:1 is assigned to product A as compared to product B when the ratio should be 3:1, incorrect cost figures will be obtained. The plan is operated to the best advantage in plants producing a few products simultaneously with simple conditions of production and costs.

Work in Process Inventories.—A disadvantage generally attributed to process cost accounting is that difficulties arise when goods remain in process uncompleted at the end of the accounting period. The problem of computing inventories in process is generally of minor importance in practice. Since costs are computed monthly or even less frequently, production schedules are arranged so that no additional materials are put in process the last few hours of the accounting period and all work in process is completed. If production involves too long a period of time to prevent completing all work in process, instructions are given to finish the work in each process so that units not completed will be between processes or completed in processes rather than partially completed.

Since a few industries are faced with the problem of computing uncompleted work in process, it is necessary to explain various complications which may arise. Production reports are a record of the total number of units received or made up in the process, the number of units completed and transferred to the next process or to finished goods, and the number of units remaining within the process. The units in process are inspected and an estimate is made of the stage of completion either on a proportional basis, such as one-half, one-third, or three-fourths, or on a percentage basis. In the estimation of the stage of completion, errors occur which form the basis for a criticism of process cost accounting. A mis-

taken estimate affects the inventory valuation on the balance sheet as well as the cost of goods sold in the profit and loss statement.

Production in terms of completed units is computed by adding to the number of units completed the proportion or percentage of total number of units remaining in the process at the close of the period. The computation of the value of work in process and of finished units is illustrated in Exhibit 57.

EXHIBIT 57
ACME CO.
COST STATEMENT
Month Ending May 31, 19—

	Process 1		Process 2		Total cost	
	Cost	Per unit	Cost	Per unit	Cost	Per unit
Materials	$ 2,000	$0.20	$ 500	$0.10	$ 2,500	$0.30
Payrolls	4,000	0.40	2,500	0.50	6,500	0.90
Factory expense	1,500	0.15	1,000	0.20	2,500	0.35
Cost in each process	$ 7,500	$0.75	$ 4,000	$0.80	$11,500	$1.55
Cost transferred			$ 6,000	$0.75		
Accumulated cost			$10,000	$1.55		
Units received in process	12,000		8,000			
Units completed and transferred	8,000		4,000			
Units in process*	4,000		4,000			
Cost of work in process	$ 1,500		$ 3,800		$ 5,300	

* Work in process is estimated to be one-half finished in Process 1 and one-fourth completed in Process 2.

In Process 1 there were 8,000 units completed and 4,000 units estimated to be one-half completed, giving as production in terms of completed units a total of 10,000 units which is divided into costs of production for the process to secure a cost per unit of $0.75. In Process 2, 4,000 units were completed and 4,000 remained one-fourth completed, which would be considered 1,000 units in terms of completed products. Thus costs for Process 2 are divided by 5,000 units, resulting in a unit cost of $0.80 and a cumulative cost of $1.55. Valuation of inventories of work in process is computed as follows:

PROCESS 1

Materials, 2,000 units (4,000 units ½ completed) × $0.20	$ 400
Payrolls, 2,000 units (4,000 units ½ completed) × $0.40	800
Factory expense, 2,000 units (4,000 units ½ completed) × $0.15	300
Total inventory in process	$1,500

Process 2	
Materials, 1,000 units (4,000 units ¼ completed) × $0.10	$ 100
Payrolls, 1,000 units (4,000 units ¼ completed) × $0.50	500
Factory expense, 1,000 units (4,000 units ¼ completed) × $0.20	200
Total valuation added in Process 2	$ 800
Inventory value from Process 1, 4,000 units × $0.75	3,000
Total inventory in process	$3,800

The inventories of work in process can be treated in the accounting records in either of two ways. After the inventory value has been determined for each process, a journal entry may be made debiting a general ledger account, Work in Process Inventory, for the total of all inventories in process and crediting each process account for its inventory value. The Work in Process Inventory account is shown as a current asset on the balance sheet, and at the beginning of the next period the entry is reversed and each process account is debited for the inventory value which constitutes its beginning inventory.

The other method does not require a journal entry. The inventory computed for each process is placed on the credit side of the process account and, after the account has been ruled, is brought down on the debit side of the account as the beginning balance for the next period. The balances of process accounts are totaled to constitute the total work in process inventory, which is treated as a current asset on the balance sheet.

Material Added at Beginning of Processes.—In many factories where ingredients are mixed according to formula, all of the material is added at the beginning of a process. A similar condition exists when units are the result of assembly of fabricated parts in the early stages of a process, subsequent operations involving only labor and machinery. In a few concerns where machine operations are paramount, labor is added at the beginning of a process, and the processing is completed without the aid of labor.

In cases where all the material is added at the beginning of a process, the cost of the material is divided by the sum of the units finished and in process, while labor and factory expenses are divided by production in terms of completed products. If, in the example of the Acme Co. (Exhibit 57) given in the preceding section, it is assumed that in Process 1 all the material is added at the beginning of the process, the material cost of $2,000 is divided by 12,000 (8,000 units finished + 4,000 units in process), and payrolls of $4,000 and factory expense of $1,500 are each divided by 10,000 units (8,000 completed + 4,000 one-half completed). The unit cost for material is $0.1666 as compared with $0.20 when the original assumption is made that one-half of material was used on units in inventory. Inventory in Process 1 is computed as follows:

Material cost, 4,000 units × $0.1666	$ 666.40
Payrolls, 2,000 units (4,000 units ½ completed) × $0.40	800.00
Factory expenses, 2,000 units (4,000 units ½ completed) × $0.15	300.00
Total inventory value	$1,766.40

Material and Labor Added at End of Processes.—A common occurrence in processes in factories is the addition of material and/or labor at the end of a process. The case of material being added late in a process is illustrated by the filling and sealing of cans in canning factories. Likewise, labor is frequently added in the form of final inspection, labeling or boxing at the end of processes. When materials are added at the end of a process, the material costs are divided by the number of units completed. Units in process are not considered in computing unit costs for material, because no material has been added in the process to the units remaining.

It may be assumed that, in the case of the Acme Co., the labor is added in Process 2 just before the completion of the work in that process. Since the inventory of goods on hand at the end of the period is estimated to be one-fourth completed, no direct labor has been applied to it. The cost of labor per unit is computed by dividing the payrolls cost of $2,500 by 4,000, the number of units completed during the period, the resulting unit cost being $0.625. It is assumed that material and factory expense are added as the production progresses, so that material cost of $500 and factory expense of $1,000 are divided by 5,000 units (4,000 units completed + 1,000 units which are estimated to be ¼ completed). Inventory for Process 2 is computed as follows:

Material cost, 1,000 units (4,000 units ¼ completed) × $0.10	$100
Payrolls, no inventory value	
Factory expense, 1,000 units (4,000 units ¼ completed) × $0.20	200
Total inventory value	$300

Inventories at Various Stages of Completion in a Single Process.—In order to obtain more accurate unit costs and inventory values, production may be divided into batches and a stage of completion may be assigned to a certain quantity of production instead of estimating the inventory in a process as being one-third or one-half completed. For example, if there are 1,000 units comprising the inventory in Process 1, 600 units may be estimated to be one-half finished and 400 units one-fourth completed.

In computing production in terms of completed units, the same methods are followed as were explained in the preceding sections. If total costs for the month for Process 1 are $12,750, tons completed are 2,000, and tons in process at the end of the period are 300, composed of 200 tons one-half finished and 100 tons one-fourth completed, the cost per

ton is computed by dividing $12,750 by 2,125 tons (2,000 completed + 200 tons one-half completed + 100 tons one-fourth completed).

Computation of Unit Costs with Beginning and Ending Inventories. Where there is an inventory of units in process at the beginning and end of a period, the stage of completion of both inventories must be considered in the computation of unit costs, the value of units transferred, and the value of the units on hand. Costs must be equitably prorated over the entire production of the process.

In the illustration below it is assumed that all material is added at the beginning of the process.

PROCESS A

Inventory, Apr. 1:	
Material, 500 units at $2	$ 1,000
Labor, 500 units, 40% completed at $3	600
Factory expense, 500 units, 40% completed at $1	200
Total beginning inventory	$ 1,800
Production Costs for Apr.:	
Material	$ 5,520
Labor	6,050
Factory expense	1,936
Total costs for April	$13,506
Inventory Apr. 30, 400 units, 30% completed as to labor and factory expense.	
Production completed during April:	
500 units from Apr. 1, inventory.	
2,000 units from products received during April.	

Since material is added at the beginning of the process, the $1,000 beginning inventory value of material represents the total material cost applicable to the 500 units. The material cost of $5,520 for April is divided by 2,400 units (2,000 units finished + 400 units in process Apr. 30) to obtain a unit material cost of $2.30.

Production in terms of completed products is computed as follows:

	Units
Apr. 1, inventory of 500 units, 60% to be completed	300
Finished production of units received during April	2,000
Apr. 30, inventory of 400 units, 30% completed	120
Production in terms of completed units	2,420

Labor cost of $6,050 and factory expenses of $1,936 are divided by 2,420 units to secure a unit cost of $2.50 for labor and $0.80 for factory expense.

The computation of inventories is as follows:

Work in Process Inventory, Apr. 30:	
Material, 400 units at $2.30	$ 920
Labor, 400 units, 30% completed at $2.50	300
Factory expense, 400 units, 30% completed at $0.80	96
Total work in process inventory	$ 1,316
Finished goods inventory:	
From Apr. 1 inventory:	
Material, 500 units at $2	$ 1,000
Labor, 200 units (500 units 40% completed) at $3.00	600
Labor, 300 units (500 units 60% completed) at $2.50	750
Factory expense, 200 units (500 units 40% completed) at $1	200
Factory expense, 300 units (500 units 60% completed) at $0.80	240
From products received during April:	
Material, 2,000 units at $2.30	$ 4,600
Labor, 2,000 units at $2.50	5,000
Factory expense, 2,000 units at $0.80	1,600
Total value of finished goods inventory	$13,990

If materials and/or labor are added as work progresses or at the end of the processing, unit costs and inventories are computed in a similar manner in accordance with the principles explained in preceding sections.

Idle Time.—An important defect justly attributed to process cost accounting is the fact the management is not informed from the accounting records of the number of hours and the cost of idle time which may exist in various processes. Since the labor cost is summarized for each process at the end of the accounting period and is divided by the total production to obtain an average unit cost, no recognition is given to the idle time element. It is correct to include normal idle time as a cost element under the general plan of process cost accounting, because the goal is to obtain actual costs, and some waste and inefficiency in the use of labor always exist.

Abnormal idle time is typical of inefficiencies from which a cost accounting system should protect management. The best safeguard is the use of piece-rates within each process. Since it is impossible to apply piece-rates to all classes of employees, the timekeeper or supervisor in each process should be instructed to keep a daily time report of hours and minutes of idle time for each employee. Either a separate idle time report can be prepared or the regular daily time reports can be arranged to show the amount of idle time in a separate column. At the end of the accounting period, when payroll records are being analyzed for distribution to processes, labor costs deemed to be the result of abnormal idle

time should be credited to the Payroll or Labor Expense account and debited to a special Idle Time account which should be closed directly to Profit and Loss or Surplus. The loss becomes apparent to management, and cost of goods sold and inventories are not inflated with a loss element which is not a true cost.

Spoiled Work and Units Lost.—Whether manufacturing processes are bench or machine operations, there will always be some units lost, spoiled, and defective. The usual procedure followed in process cost accounting does not provide separate accounting for spoiled and defective work; the costs assigned to each process are divided by production in terms of completed products after eliminating units lost, spoiled, and defective. Thus units in process and completed have to bear the loss as an added element of cost.

Each process should keep a daily record of units lost, spoiled, and defective, and daily reports should be summarized at the end of the accounting period. Scrap or residue value for materials reclaimed from spoiled and defective work should be credited to the process concerned and debited to the Materials account through the medium of a journal entry; a scrap account in the subsidiary stock ledger may be used to record scrap values returned to stockrooms.

Likewise, in analyzing the daily records of units lost, spoiled, and defective, if it is discovered that a portion of the total is due to abnormal conditions resulting from inefficiency of labor or from inferior materials, the units in question should be included with units finished and in process in computing the average unit cost for the process. The number of units lost, spoiled, and defective due to abnormal conditions should be multiplied by the cost per unit in the process, and the resulting amount should be charged to a Lost, Spoiled, and Defective Work account and credited to the process through the medium of a journal entry. The special loss account should be closed directly to Profit and Loss so that inventories will not be improperly inflated.

The normal cost of spoiled and lost units is absorbed as an additional cost of units in process as explained in connection with the following illustration, Exhibit 58.

In Process 1, 2,000 were spoiled, which is considered a normal condition of production, so the remaining units completed must bear an additional cost per unit. The unit cost of $2 is determined by dividing the material, labor, and factory expenses, totaling $20,000 by 10,000 units (12,000 − 2,000 spoiled).

The 500 units lost owing to normal shrinkage involves a more complicated cost analysis for Process 2. There were 8,500 units completed, and 1,000 are in process one-half completed, which gives a total production in terms of completed units of 9,000. The labor cost and factory

expenses totaling $6,300 are divided by 9,000 units to obtain an average cost per unit of $0.70.

EXHIBIT 58
COSTS OF UNITS LOST, SPOILED, AND TRANSFERRED

	Process 1	Process 2	Total costs
Material	$10,000		$10,000
Labor	6,000	$ 4,500	10,500
Factory expenses	4,000	1,800	5,800
Total process costs	$20,000	$ 6,300	$26,300
Cost transferred		$20,000	
Accumulated costs		26,300	
Units received	12,000	10,000	
Units spoiled	2,000		
Units lost (shrinkage)		500	
Units in process (½ completed)		1,000	
Units transferred	10,000	8,500	
Unit cost in each process	$ 2.00	$ 0.70	
Loss per unit due to shrinkage		0.10526	
Accumulated unit cost	2.00	2.80526	

The amount of $0.70 per unit would be the total unit cost for Process 2 if the 500 units lost had not had a value of $2 a unit or a total value of $1,000 when transferred to Process 2. Thus units processed in Process 2 must bear an additional cost per unit of $0.10526 computed by dividing $1,000, the value of 500 units lost at $2 a unit when transferred to Process 2, by 9,500 units, representing 8,500 units completed and 1,000 units in process.

The same result is obtained by dividing the cost of $20,000 transferred from Process 1 to Process 2 by 9,500, representing a total of units in process and completed; from the quotient, $2.10526, is subtracted the cost per unit of $2 before the shrinkage occurred to obtain a loss due to shrinkage of $0.10526 per unit.

Thus as a normal condition, if units are lost or spoiled in a beginning process, the production in terms of completed units is divided into the total cost of the process, the loss being absorbed by units finished and in process. The same procedure is followed in subsequent processes, but, in addition, the accumulated value of units transferred and lost in a process must be absorbed by units finished and unfinished in the process responsible for the loss. In the illustration above, units completed and in process were considered alike, and each unit was allotted an equal

share of the loss due to shrinkage. Since units in process will not be completed until the next period, there is a possibility that they may be required to share in a loss due to shrinkage for the next accounting period.

Questions

1. To what types of industries is process cost accounting best adapted? What methods of production within an enterprise are most favorable in the use of process cost methods?

2. Of what value for managerial control is the average cost of a product? Is an average a typical cost? a true cost? a reliable cost?

3. Describe briefly the general accounting principles underlying the operation of a system of process cost accounting.

4. What is meant by departmentalization of a factory? What factors are the basis for setting departmental lines? Of what value is proper departmentalization in the operation of a system of process cost accounting?

5. Describe the accounting procedure involved in the issue of materials from the stockroom to processes.

6. Trace the entries required to record weekly labor and supervision payrolls and to handle the disbursement of payrolls.

7. Explain the general procedure required to record factory overhead expenses, exclusive of materials and labor, and to distribute the expenses to processes.

8. What basis would you recommend as being equitable for the distribution of the following expenses to processes:

a. Rent?
b. Heat?
c. Power and light?
d. Unemployment compensation taxes?
e. Repairs?
f. Fire insurance?
g. Depreciation of machinery?
h. Supervisory payrolls?

9. What type of production records should be maintained for each process? What use is made of the production statistics?

10. Describe the method of determining total costs and unit costs when production is performed on the basis of successive "runs" of different products at scheduled periods of time.

11. How is it possible to process two or more products simultaneously in the same process and compute a satisfactory unit cost for each type of product? Explain.

12. How are work in process inventories computed? What is meant by production in terms of completed products?

13. How are work in process inventories evaluated when material is added at the beginning of the process? at the end of the process? at various stages of completion in the process?

14. Without using figures, explain how unit costs can be computed when there are both beginning and ending inventories.

15. How should idle time be accounted for and treated when a process cost accounting system is in use? Should normal idle time receive a different treatment from abnormal idle time? Explain.

16. How are lost and spoiled units accounted for in the process cost accounting system? How are unit costs affected in the third process of a series of five processes required to complete a product when 50 units are lost which had an accumulated cost of $1 a unit when transferred to the third process?

Problem 1

The Ace Bottling Works bottled seven flavors of soda pop during January, 19—. Production consisted of two processes, preparing and bottling. Costs included:

Production expenses	Preparing department	Bottling department	Total
Materials	$250		$250
Labor	125	$ 75	200
Factory overhead expenses	225	125	350

All purchases were paid in cash and were consumed during the month. Production amounted to 50,000 bottles, and there was no work in process at the beginning or at the end of the period.

a. Prepare a cost statement for January showing the total and unit costs for each department and the accumulated total and unit costs.

b. Present journal entries and ledger accounts.

Problem 2

The National Canning Co. canned tomatoes from July 1 to Aug. 1. There are three distinct processes: preparation, cooking, and canning.

Expenses for the period:

Production expenses	Preparation	Cooking	Canning	Total
Materials	$1,500	$ 250	$1,000	$2,750
Labor	1,000	500	250	1,750
Factory overhead expenses	500	750	750	2,000
Total	$3,000	$1,500	$2,000	$6,500

There was no beginning inventory.

	Cans
Units started in process	150,000
Units completed	140,000

Work in process as of July 31:

3,000 units estimated to be ½ completed in the preparation department.

3,000 units just completed by the cooking department.

4,000 units in the canning department, estimated to be ¾ completed.

Required:

a. A cost statement for the month of July.

b. A statement of cost of work in process and finished goods inventories.

c. Journal entries for the month.

Problem 3

The Triple Cola Bottling Co. produces three products: Triple Cola, soda pop, and ginger ale. The plant is small, and it is necessary to plan production schedules so

that the plant and equipment are used exclusively for one product for a number of hours followed by a period of 3 hr. of shutdown during which preparations are being made for the production of a second product.

During August the company's production report shows the following information:

Products	Hours of plant use for production	Production—number of bottles
Triple Cola	120	100,000
Soda pop	80	110,000
Ginger ale	30	40,000
Total	230	250,000

A summary of material requisitions shows direct material costs charged as follows: Triple Cola, $1,000; soda pop, $800; and ginger ale, $800. Indirect materials totaled $220.

An analysis of payrolls vouchered for the month discloses that direct labor charges were Triple Cola, $400; soda pop, $200; and ginger ale, $90. Indirect labor costs, including superintendent's salary, clerical help, and indirect factory workers, totaled $450.

The following factory overhead expenses were vouchered and paid during the month: rent, $150; equipment repairs and maintenance, $30; light and power, $75; and water, $50. Other factory expenses recognized by means of adjusting entries included: bottle breakage, $25; depreciation of machinery and equipment, $160; insurance expired, $10; and taxes accrued, $80.

Factory overhead costs are to be allocated to products on the basis of the number of bottles of production, but the costs are to be apportioned on a basis of weighted averages as follows: soda pop, 1; Triple Cola, 2; and ginger ale, 3.

a. Prepare a statement showing the weighted average production of beverages for the month.

b. Submit a cost statement to show the cost per unit and total costs for material, direct labor, and factory overhead for each product.

c. Prepare journal entries to record all transactions for August.

d. Set up general ledger accounts and post.

Problem 4

The Dextrose Candy Bar Co. produces three kinds of candy bars which may be designated as A, B, and C. The company keeps its books on the process accounting basis. There are three distinct processes: kitchen, coating, and wrapping. The following table indicates the relative importance of each bar in each process:

Type	Kitchen, points	Coating, points	Wrapping, points
A	4	2	2
B	5	1	2
C	10	3	3

Total expenses for each department for February are as follows:

Kitchen	$ 620
Coating	400
Wrapping	150
Total	$1,170

Production:

Type	Bars
A	10,000
B	12,000
C	8,000

a. Prepare a statement showing the weighted average production for candy bars for each process.

b. Submit three cost statements showing costs for each type of candy bar.

Problem 5

The Midwest Manufacturing Co. in producing article Z has a process cost accounting system but operates as a single process. The cost records are kept on a monthly basis.

On June 1, a statement of inventories shows:

Raw material	$2,000
Work in process:	
Materials, 400 units at $2	800
Labor, 400 units 40% completed at $3	480
Total factory expenses, 400 units 40% completed at $0.50	80
Total opening inventories	$3,360

Purchases of raw materials and operating expenses for the period are as follows:

Materials	$6,000
Labor	8,448
Factory overhead expenses	1,584

Requisitions show that $5,460 in materials have been issued from the stockroom to the production department.

The production report for the month shows that 2,500 units of article Z were completed and transferred to finished goods during the period.

All material is used in production at the beginning of the processing.

There were 1,500 units of Z sold for cash during the period at a 50% markup on cost.

On June 30 there are 500 units in process averaging 60% completed as to labor and factory expenses.

Required:

a. Journal entries and ledger accounts.

b. Cost statement exhibiting unit costs, total costs, and inventory valuations.

Problem 6

The Excello Co. began operations, Sept. 1, 19—, with no opening inventories of material, work in process, or finished stock. The company fabricates a single product in two separate processes which are designated as Processes 1 and 2.

During the month of September materials were purchased to the amount of $10,000, payrolls totaled $3,500, and factory overhead expenses amounted to $1,300. Material requisitions show that 1,600 units of material costing $8,000 were used in Process 1; no material was requisitioned by Process 2. An analysis of payrolls indicates that $2,000 is assignable to Process 1 and $1,500 to Process 2. Factory overhead expenses are allocated to processes directly and through the media of distribution bases as follows: Process 1, $800; Process 2, $500.

During the month, 1,200 of the 1,600 units processed in Process 1 were completed and transferred to Process 2, while 400 units remained in Process 1, ½ completed. In Process 1 all materials are used at the beginning of the process.

Process 2 received the 1,200 units completed in Process 1 and completed 600 units which were transferred to finished goods. The 600 units which remained in Process 2 on Sept. 30, as work in process are estimated to be ⅓ finished.

Open the necessary ledger accounts; prepare journal entries, and post to accounts; submit a cost statement to show the cost per unit for each process, the accumulated unit and total cost at the end of each stage of production, and the value of all inventories.

Problem 7

Assume the same conditions of cost and production as given for the Excello Co., Prob. 6, with the following exceptions.

In Process 1, 200 units of the 1,600 units which were processed were spoiled;[1] the scrap value of the spoiled work, which is $2 a unit, is transferred back to the Materials account. There were 1,000 units completed and transferred to Process 2, while 400 units remained in Process 1, ¾ completed. All the materials were used at the beginning of Process 1.

In Process 2, 50 of the 1,000 units received from Process 1 were lost in the process.[1] The process completed 650 units which were transferred to Finished Goods. On Sept. 30, there were 300 units in process, estimated to be ⅓ completed.

Open the necessary ledger accounts; prepare journal entries, and post to accounts; submit a cost statement to show the cost per unit for each process, the accumulated unit and total cost at the end of each stage of production, and the value of all inventories.

Problem 8

Assume the same conditions of cost and production as given for the Excello Co., Prob. 6, with the following exceptions:

In Process 1, materials, labor, and overhead costs are added to production equally as production progresses. During the month, 100 units of the 1,600 units processed were completed and transferred to finished goods, 1,100 units were completed and transferred to Process 2, while the remaining 400 units constituted work in process and were estimated to be one-fourth completed as to material, labor, and factory overhead expense.

In Process 2, additional material cost of $1,000 was added as a normal production condition. All the material in this process was used at the moment units were completed and ready for transfer to finished goods. Process 2 completed 800 of the 1,100 units received from Process 1, but, during the processing, 100 units were spoiled and returned to the materials stockroom where a credit memorandum was issued to Process 2 for $300 or $3 a unit, the present scrap value.[1] The 200 units which remained in Process 2 on Sept. 30 were estimated to be ½ completed as to labor and factory overhead expense.

[1] Considered to be a normal operating condition.

Submit a cost statement to show the cost per unit for each process, the accumulated unit and total cost at the end of each stage of production, and the value of all inventories.

Problem 9

The Marathon Bicycle Co. keeps its cost records on a process cost accounting basis. Assemblage is divided into three departments or processes: I, II, and III. The following information is given for the month of June:

Production costs	I	II	III	Total
Material	$3,615	$ 175	$ 374	$ 4,164
Labor	424	2,714	581	3,719
Factory overhead expenses	782	1,321	264	2,367
Total	$4,821	$4,210	$1,219	$10,250

During the month 600 units were started in process. There was no beginning inventory. In Process II, 10 units were spoiled, of which 4 units were spoiled because of defective materials considered to be an abnormal condition. In Process III, 5 units were lost. All normal spoilage costs are to be distributed among the units remaining in process and completed on the basis of actual number of units, regardless of the stage of completion. On June 30 there were 30 units remaining in Process III, estimated to be ½ completed as to labor and factory overhead expense, all material having been added.

Required:

a. Journal entries for June.

b. A cost statement showing the cost per unit for each process, the accumulated unit and total cost at the end of each stage of production, and the value of inventories.

c. A statement showing the value of spoiled and lost units.

CHAPTER XIV

PROCESS COST ACCOUNTING (*Continued*)

Management and accountants agree that the principles underlying process cost accounting are sound and that the general plan of costing is of definite value in the field of cost accounting. Four forms of improvement are being added to process cost accounting so that more complete information is available and managerial control can be exercised over plant operations. The improvements include the use of operations or production centers as cost media instead of larger spheres of activity such as processes or departments; accumulation of costs for service departments as well as operations; the use of detailed subsidiary cost records for materials, labor, factory overhead costs, and production; and budgetary control of production and of costs.

Weaknesses of Processes and Departments as Accounting and Production Divisions.—The use of processes or departments implies that the factory is subdivided into a comparatively few large divisions, each under an administrative authority such as a department head or general foreman. A process or department generally includes a number of related operations, which involve the employment of a sizable group of men and machines. A foundry, a machine shop, a power plant, an assembly line, or a gristmill might each constitute a process or a department.

Although a process may be a logical or practical unit of division in a plant from the point of view of supervision of production, it is frequently an unsatisfactory unit for cost accounting purposes. The cost accountant is limited in his computation of cost data to an average cost per unit for each process, which may not enable him to guide management properly in obtaining the most efficient operation of the plant. An average cost for material, labor, and factory overhead which combines conditions of production for machines differing in original cost, size, and power consumption and for labor varying as to skill, efficiency, and wage rates is of problematical value. It is only through a minute classification and a detailed analysis of costs that management can be properly informed as to operating efficiency.

Operations as Accounting and Production Divisions.—An operation cost system involves the recording of material, labor, and factory overhead by operations or by production centers through which products pass. The departmental division may be maintained for administrative

reasons, but, for purposes of costing, smaller subdivisions are advisable. The type of work performed in each operation or production center should be alike. Machines of the same size performing like operations and labor operations of the same type should be considered as a separate cost center. Although the grouping of similar operations or machines means added convenience for the cost accountant, it is not necessary to rearrange the physical plant. Two groups of machines performing the same operation may be classed as a cost center, even if they are located at opposite ends of a factory building.

The general plan of accounting for operations is similar to that of process cost accounting. It is assumed that all units processed in the same operation are uniform and have the same cost. The cost per unit, an average cost, is obtained at the end of each accounting period by dividing the costs of an operation by the number of units completed in the operation center. Usually material costs are separated from operation costs, which are composed of labor and factory expense assigned to operation centers. Thus the total cost of a product is ascertained by adding to the material cost the costs of the several operations through which it passes.

The accounting records for operations will differ with types and sizes of business enterprises. If the operations are not too numerous, it may be advantageous to have an account in the general ledger for each operation. It may be more practical to carry a general ledger account for each large process or department, such as the foundry or machine shop, and to have, as a subsidiary record in support of it for each operation center within the process, an analysis sheet termed a "standing order" which can be used as a costing medium. The general ledger account for the process or department would show total costs, while the analysis sheet for each operation would show detailed costs assigned to the operation and would be used as a basis for computing unit costs.

Service Departments as Intermediate Costing Divisions.—Such departments as superintendent's office, payroll, personnel, planning, maintenance, repairs, purchasing, trucking, shipping, and stockrooms are operated for the purpose of facilitating factory operations. The cost of sustaining service departments is an important part of the total factory overhead cost, and the items composing the cost of each department should be available to management so that proper control can be exercised.

An account can be carried in the general ledger for each service department. Each service department would receive entries from the Materials, Payroll, and Factory Overhead Expense accounts as a function of the process of closing the books at the end of each period, distribution bases being used for the apportionment of indirect charges. An analysis

sheet can be used as a subsidiary record for each service department to show the detailed costs accumulated for the department. After the cost of maintaining each service department has been obtained, the next step in the closing process is the distribution of service department costs to operations in an equitable manner by means of selected allocation bases.

Budgetary Control.—The use of operations as costing units, the accumulation of costs by service departments, and the recording of detailed costs and production in subsidiary records make practical the control of manufacturing activities through the media of cost and production budgets.

Separate budgets can be prepared for material, labor, factory overhead, and production in terms of units. The material budget will exhibit materials and supplies requirements for the budget period for each service department and for each operation. The labor budget will show for the budget period the labor requirements and wages for each class of wage earner for each service department and operation. The factory overhead budget will contain an estimate of each type of expense, such as taxes, rent, depreciation, power, and repairs, which can be classified by service departments and operations. Production budgets will include estimates of the expected production for the period in terms of units, hours of work, and machine operations for each operation. All budgets should be prepared after an exhaustive investigation of past production and of existing cost conditions and after attempting a forecast of conditions to be effected during the budget period.

The budget estimates can be incorporated in the subsidiary records for service departments and operations where they are readily available for comparison with actual costs. Subsidiary analysis sheets or standing orders which can be used for both budget estimates and actual costs are described in succeeding sections.

A PLAN OF COSTING WHICH INCLUDES OPERATION COSTS, SERVICE DEPARTMENT COSTS, AND BUDGETARY CONTROL

Manufacturing and cost conditions vary to such an extent that special adaptations of accounting technique are required in an individual enterprise, but it is possible to outline a general procedure of cost accounting which uses the general principles underlying budgetary control and process cost accounting with operation centers and service departments as costing units.

Accounts and Subsidiary Records.—The general ledger may contain a Materials account, a Payroll account, a Factory Overhead Expense account, an account for each service department, and an account for each operation. Or a controlling account for each department or division may be substituted in lieu of an account for each operation, and information

concerning each operation within the department or division may be delegated to subsidiary records.

The Materials account controls one or more stock ledgers which show quantities and cost for each class of materials and supplies. The Payroll account controls payroll sheets, daily time reports, and piece-rate reports. The Factory Overhead Expense account controls an expense ledger or, more commonly, a group of analysis sheets or standing orders, one for each type of expense such as taxes, depreciation, and rent. The standing orders can be arranged so as to exhibit the budget estimate and the actual amount of each expense, classified by service departments and operations. Either direct apportionment or distribution bases are used to effect the

STANDING ORDER No.—	Rent				Distribution base: floor space	
Service departments and operations	January			February		
	Actual	Budget	Variance	Actual	Budget	Variance
Planning						
Personnel						
Stockrooms						
Purchasing						
Payroll						
Cost accounting						
Operation 1						
Operation 2						
Operation 3						
Operation 4						
Total						

Exhibit 59.—Standing order for expenses.

allocation of the budget estimates at the beginning of the period and the actual expenses at the end of the period to service departments and operations. A form of standing order typical of analysis sheets subsidiary to the Factory Overhead Expense account is illustrated as Exhibit 59.

A separate account may be used in the general ledger for each service department such as the superintendent's office, personnel, planning, and payroll. In order to exhibit the detailed items of the budget estimate and the actual expense incurred in the operation of each service department, it is proposed that a standing order or analysis sheet be prepared as a subsidiary record for each department. The estimated and actual expense items, classified by type of expense and apportioned by service departments and operations in the standing orders subsidiary to the Factory Overhead Expense controlling account, are reclassified to show expenses

for each service department. A service department standing order typical of this group of subsidiary records is illustrated as Exhibit 60.

It may be advantageous to have an account in the general ledger for each operation although, if the operations in the plant are numerous, the general ledger would be unnecessarily congested. As previously explained, an alternative is to use an account in the general ledger for each department or division to control a group of standing orders, one for each operation that is a part of the larger sphere of activity, the

STANDING ORDER No.—	Superintendent's office			Distribution base: labor hours		
Expenses	January			February		
	Actual	Budget	Variance	Actual	Budget	Variance
Variable expenses:						
Salaries						
Supplies						
Telephone						
Telegraph						
Light						
Total variable expenses						
Fixed expenses:						
Depreciation						
Taxes						
Rent						
Heat						
Total fixed expenses						
Total						

Exhibit 60.—Standing order for service departments.

department or division. The standing order for each operation should exhibit the budget estimates and the actual results in terms of material, labor, factory overhead costs, and apportioned service department costs. Exhibit 61 exemplifies a type of standing order which may be used for each operation.

Another important account which should be carried in the general ledger is Finished Goods which, as a controlling account, summarizes entries made in a subsidiary finished stock ledger. A Cost of Goods Sold account, which is closed into the Profit and Loss account at the end of the period, generally is used to record the cost of goods sold during the accounting period.

Accounting Procedure.—The accounting procedure is similar to the one explained in connection with process cost accounting except for the

additional classification of expenses required to obtain the cost of each service department.

STANDING ORDER No.—				Operation 10: drilling		
Expenses	January			February		
	Actual	Budget	Variance	Actual	Budget	Variance
Variable expenses:						
Materials						
Payroll						
Supplies						
Power						
Repairs						
Total variable expenses						
Fixed expenses:						
Depreciation						
Taxes						
Rent						
Heat						
Total fixed expenses						
Apportioned service department expenses:						
Planning						
Personnel						
Trucking						
Maintenance						
Cost accounting						
Total apportioned expenses						
Total						

Exhibit 61.— Standing order for operations.

As materials and supplies are obtained from stockrooms, the requisitioning department or operation center number or symbol is indicated on requisitions. At the end of each period, requisitions are sorted by service departments and operations to form the basis for the general ledger entry debiting each department and operation, the credit being to the Materials account. The amount of material used by each department and operation is inserted in the standing order for each department and operation.

Payrolls are analyzed at the end of each period, and a general journal entry is made debiting each service department and operation and crediting the Payroll account. The amount of payroll chargeable to each service department and each operation is inserted in the appropriate department and operation standing order.

The Factory Overhead Expense account in the general ledger controls standing orders for each class of expense such as taxes, rent, depreciation, and repairs. In the voucher register or cash disbursement records, the Factory Overhead Expense account is charged for expense vouchers passed for payment during the period, and the Vouchers Payable account is credited. At the end of the period adjusting entries are made to properly recognize such expense items as depreciation, taxes accrued, and expired insurance, with the result that the Factory Overhead Expense account is charged in total; the detailed charges are made to standing orders, such as taxes, rent, depreciation, and repairs, which constitute a subsidiary record.

It is suggested that the standing orders be used for the distribution to service departments and operations of both the budget estimates of expenses at the beginning of the period and the actual expenses at the end of the period, so that variances between estimated and actual costs can be more readily shown at the end of the accounting period. Budget estimates of material, labor, and factory overhead expenses can be transferred from budgets to standing orders at the beginning of each accounting period. A few of the estimated overhead expenses can be apportioned directly to service departments and operations, but in most cases distribution bases must be selected which will permit an equitable allocation. While the existing conditions of operation within the factory will prevent the use of any arbitrary methods, suggested bases are listed in Exhibit 40, page 219. The same bases must be used for the estimated overhead expenses at the beginning of the period and for the actual expenses at the end of the period.

After the standing orders subsidiary to the Factory Overhead Expense account have been used to classify expenses by service departments and operations, the next step in the closing process is the transfer of the total overhead to the service departments and operations. This is effected by a journal entry debiting each service department and operation for the total amount assigned to it and crediting the Factory Overhead Expense account for the total. In the subsidiary records, amounts chargeable to each department and operation are transferred to the respective standing orders.

After the transfer has been made, the standing order for each department and operation exhibits the amount of each type of expense incurred for the department and operation.

The next step in the closing process is the transfer to operation centers of the total cost of maintaining each service department so that the total cost of manufacturing will finally be classified by operations. Theoretically, since some service departments such as the personnel department serve other service departments, service department charges should be

transferred to other service departments as an intermediate step in the process of transferring costs to operations. In many enterprises such an elaborate distribution is impractical and service departments total costs are transferred directly to operations.

Exhibit 43, page 222 will suggest bases for the distribution of both the estimated and actual service departments costs to other service departments and to operations; the budget estimates are allocated at the beginning of the budget period, and the actual costs are distributed at the end of the period.

Service departments costs are distributed to operations by means of a general journal entry debiting each operation and crediting each service department account. The standing orders, which constitute the subsidiary record for operations, show the directly charged expenses and the apportioned service departments costs for the period.

Computation of Unit and Total Costs.—The total cost of each operation is divided by the total period production in terms of completed products to obtain the average cost per unit. Since costs and production are accounted for by relatively small spheres of activity, *viz.*, operations, generally there is little difficulty encountered in determining production in terms of completed products. At the end of each accounting period all production within each operation can be completed, so that all inventory of work in process is between operations, having been completed in one operation and fabrication not having started in the succeeding one. To obtain the value of work in process, it is only necessary to add together the separate unit costs of production for operations through which the material has progressed.

Transferring Costs.—Since all products processed may not pass through the same operation centers, generally it is not possible to transfer the total cost of each operation to successive operating centers. In fact in some establishments it may not be practical to attempt to transfer any operation costs to other operations. In such cases the total cost of each operation, representing the cost of goods completed in the operating center during the period, is debited directly to Finished Goods, and each operation is credited.

In case it is desirable to transfer costs from one operation center to another on an accumulative basis, the production of a single operation must be accounted for in terms of the number of completed units which are transferred to each other department. The unit cost for the operation is multiplied by the number of units transferred to each successive operation, and an entry is made debiting the operations which receive the goods and crediting the operation transferring the production.

Comparison of Budgets with Actual Production and Costs.—If budgets are prepared in advance of the budget period to include estimates of

expenses by types, reclassified by service departments and operation centers, the actual costs obtained at the end of the period can be compared and variances can be analyzed for causes of the differences. Likewise, budget estimates of production for each operation can be compared with actual performance.

It is advantageous to have subsidiary records such as the standing order forms suggested for types of overhead expense, service departments, and operations, because there is provided a means of comparing in detail the estimated items contained in the budget and the actual costs of production during the period.

Questions

1. What advantages accrue from the use of operations as costing units in place of larger spheres of production activities such as processes or departments?
2. Why is it advantageous to management to accumulate costs for service departments as intermediate cost divisions?
3. Describe the procedure of accumulating costs by both service departments and operations and subsequently of transferring service departments costs to operations.
4. What general ledger accounts and subsidiary records may be used to record material, labor, and factory overhead transactions when an operation cost plan, with service departments and budgetary control, is employed?
5. What are standing orders? Explain how each of the following standing orders are used: standing orders for expenses, standing orders for service departments, and standing orders for operations.
6. Explain how budget estimates of expenses may be prepared in advance of the accounting period and inserted in the standing order forms where they will be available for comparison with actual expenses at the end of the accounting period.
7. What base of distribution would you select for the allocation of each of the following expenses to service departments and operations of a manufacturing enterprise:

a. Labor?
b. Materials and supplies?
c. Telephone expense?
d. Spoiled work?
e. Depreciation?
f. Water expense?

8. What distribution base would you suggest be used for the allocation of each of the following service departments costs to other service departments and operations:

a. Employment?
b. Cost accounting?
c. Maintenance and repair?
d. Payroll?
e. Purchasing?
f. Power plant?
g. Statistical?
h. Stenographic?
i. Superintendent's office?
j. Welfare?

9. Explain how costs are transferred from operations to finished goods, how work in process inventories are determined, and how unit costs are computed.

Problem 1

The Northern Manufacturing Co. uses 10 successive operations in completing the finished product. Using the following information pertaining to the month of July, 19—, you are asked to show journal entries to close the books, using operation cost accounting methods, and to present a cost statement showing total material, labor,

and factory overhead expenses and unit costs for each element of expense for each operation.

1. Material:

Operation	
1	$4,692
6	471
9	143

2. Direct labor costs:

Operation		Operation	
1	$250	6	$510
2	120	7	105
3	375	8	65
4	400	9	125
5	150	10	220

3. Factory overhead expenses, $3,950.
   (To be distributed on the basis of direct labor costs.)
4. Beginning inventory:
   20 units completed in operation 4 (material, $26; labor and factory overhead expense, $24).
   50 units completed in operation 8 (material, $105.00; labor and factory overhead expense, $112.50).
5. Ending inventory:
   10 units completed in operation 3.
   25 units completed in operation 6.
6. 2,500 units were started in process during July.

Problem 2

The Tasty Packing Co. buys hogs and processes pork products. Production consists of pork, ham, bacon, and lard. Eight individual operations are performed. They are designated by numbers 1 to 8.

An analysis of the various operations shows:

Operation	Types of Products
1	Pork, ham, bacon, and lard
2	Pork, ham, bacon, and lard
3	Lard
4	Bacon, ham, and pork
5	Bacon and ham
6	Ham
7	Bacon
8	Pork

Hogs started in process and completed during the month of May represented:

	Pounds
Pork	1,000,000
Ham	800,000
Bacon	700,000
Lard	500,000

Factory overhead expenses have already been allocated to the various operations, giving the following operation costs:

Operation	Material	Labor	Factory overhead expense
1	$123,000	$ 8,000	$ 4,000
2		10,000	11,000
3		250	250
4	15,000	25,000	25,000
5		21,750	12,000
6	3,200	4,000	3,000
7	[illegible],500	5,000	9,000
8	3,400	6,000	7,000
	$148,100	$80,000	$71,250

Prepare a statement showing the average cost per pound for each of the four products, and present journal entries transferring costs.

Problem 8

The Fit-rite Clothing Co. manufactures men's suits. The company rents its building and machinery. Manufacture consists of three operations: cutting, sewing, and finishing. The following information is obtained from the accounting records of the company for March:

1. Expenditures recorded in the voucher register:

Material	$ 4,950
Supplies (thread, etc.)	750
Payrolls	3,570
Factory expense:	
Rent	432
Employees' insurance	171
Repairs	521
Utility expense	919
Total	$11,313

2. Beginning and ending inventories:

	Beginning inventories		Ending inventories	
	Amount	Units	Amount	Units
Material	$1,450		$2,010	
Supplies	210		170	
Finished goods	1,265	101	1,495	130
Cutting department	51	10 (½ finished)		
Sewing department	135	20 (¼ finished)		15 (⅓ finished)
Finishing department				25 (⅗ finished)

3. Allocation bases for factory overhead expenses:

Rent	Floor space
Employees' insurance	Number of employees
Repairs	Machine hours
Utility expense	Machine hours

Department	Floor space, square feet	No. of employees	Machine hours
Cutting	12,000	17	10,000
Sewing	20,000	25	40,000
Finishing	8,000	10	17,500
Total	40,000	52	67,500

4. Materials and stores requisitioned:

Department	Materials	Supplies
Cutting	$4,390	
Sewing		$290
Finishing		500
Total	$4,390	$790

5. Payroll distribution:

Department	Labor Cost
Cutting	$ 900
Sewing	1,500
Finishing	1,170
Total	$3,570

6. Miscellaneous information:

a. All material in the cutting department is added at the beginning of the process.

b. Spoilage—100 units were spoiled by fire when ½ finished in the sewing department; 10 units were spoiled as they were completed in the cutting department; the cost is shared equally by all units completed and in process.

c. Units started in process, 1,000.

Required:

a. Journal entries to record distribution and transfer of costs.

b. A cost statement for March showing unit costs and total costs for each operation.

Problem 4

The Monroe Assembly Plant, which assembles the Monroe machines, receives parts from the Monroe Parts Corporation. Expenses are allocated among six service departments and three operations. The accounts of the service departments are closed out in the order listed in the following table:

Service departments and operations	Floor space, square feet	No. of employees	Machine hours	Survey of utility expense
1. Janitor department		2		
2. Personnel department	1,000	3		2
3. General office	2,400	9		2
4. Repair department	400	7		3
5. Inspection department	400	6		2
6. Finishing department	600	18		1
7. Operation I	3,600	200	4,000	40
8. Operation II	6,000	130	5,000	50
9. Operation III	10,000	330	3,000	20
	24,400	705	12,000	120

Numbers 4, 5, and 6 are distributed on the basis of machine hours; Nos. 2 and 3 on the basis of the number of employees, and No. 1 on the basis of floor space.

The following table indicates the basis for distribution of indirect expenses:

Expenses	Total	Basis of allocation
Depreciation	$ 426.00	Floor space
Property taxes	457.00	Floor space
Utility expenses	1,242.00	Survey

Direct expenses include:

Janitor	$ 384.00	Finishing	$ 2,142.00
Personnel	814.00	Operation I	42,175.00
General office	1,511.00	Operation II	40,243.00
Repair	1,414.00	Operation III	54,019.00
Inspection	910.00		

Required:

a. Journal entries recording the allocation of service departments costs to operations.

b. A schedule showing expenses for each service department and operation and the distribution of service departments costs to operations.

Problem 5

The Ajax Steel Products Co. manufactures three products which may be designated as X, Y, and Z. The company has four service departments: supervision, personnel, inspection, and building service. There are five operations coded as 1, 2, 3, 4, and 5.

Product X is processed in operations 1, 2, 4, and 5.

Product Y is processed in operations 1, 3, and 5.

Product Z is processed in operations 2, 3 and 4.

Production records for April show the following units completed: product X, 10,000; product Y, 8,000; and product Z, 5,000. There were no beginning or ending work in process inventories.

A survey of service departments and operations disclosed the following data for April:

Department or operation	Number of employees	Cost of equipment	Floor space, square feet	Material requisitioned	Payroll distribution
Supervision	6	$ 500	900	$ 100	$ 800
Personnel	4	200	600	75	600
Inspection	10	100	400	25	1,000
Building service	5	700	300	600	400
Operation 1	20	3,000	2,000	10,200	2,000
Operation 2	15	4,000	2,500	4,800	2,250
Operation 3	30	1,000	5,000	2,000	4,250
Operation 4	10	6,500	3,600	1,200	1,100
Operation 5	30	8,000	6,700	1,000	4,000
Total	130	$24,000	22,000	$20,000	$16,400

Depreciation is computed as 10% yearly of the cost of equipment and is distributed to departments and operations on the basis of the cost of equipment in each division. Other expenses for the month are to be apportioned to service departments and operations as follows: Power and light, $500; supervision, 2%; personnel, 1%; inspection, 3%; building service, 5%; operation 1, 10%; operation 2, 15%; operation 3, 14%; operation 4, 20%; and operation 5, 30%. Heat, $60: floor space. Compensation insurance, $120: number of employees. Social security taxes, $656: payroll. Rent, $400: floor space. Taxes, $40: cost of equipment. Repairs, $150: $60 to operation 1 and $90 to operation 5. Spoiled work, $60: $20 to operation 2 and $40 to operation 3. Telephone and telegraph, $45: $30 to supervision and the balance equally to the other three service departments. Water expense, $30: floor space.

The service departments costs are allocated directly to operations on the following bases: supervision, according to payroll for each operation; personnel, number of employees; inspection, 30 per cent each to operation 3 and operation 5 and the balance equally over other operations; and building service according to floor space.

a. Present journal entries to record the transfer of costs.

b. Prepare a statement showing the costs for each department and operation, the apportionment of service departments costs to operations, and unit costs for each operation.

c. Submit a statement containing the average cost of each product.

CHAPTER XV

JOINT COST AND BY-PRODUCT ACCOUNTING

Critics of cost accounting frequently contend that the prevalence of joint costs both in production and selling prevent the accurate computation of unit costs in the majority of business enterprises. It must be admitted that if the sole purpose of cost accounting is to derive strictly accurate unit costs, the existence of joint costs in so many instances of unit cost computation will give a sound basis for the criticism. The derivation of unit costs is not the only function of cost accounting; the importance of cost statistics to management in controlling production and distribution through comparisons of costs and productivity of departments, jobs, workers, territories, and salesmen has been discussed in earlier sections. However, a reexamination of cost subjects studied does offer many illustrations of the existence of joint cost conditions.

Problems of Joint Costs a General Condition of Business.—Problems of joint costs are not peculiar to any single type of industry but are existent in more or less degree in every business enterprise. Conditions of joint costs were discussed in connection with the proper valuation of materials and supplies purchased, received, and placed in stock or in manufacturing operation. Generally, two or more dissimilar products are purchased through the medium of a single purchase order, are included in a single freight shipment, are invoiced, vouchered, and payment is made as a single business transaction. In order to obtain the unit costs for each product, it is necessary to apportion the joint costs of purchasing, receiving, and handling the shipment to the products on the basis of dollars of purchases or weight or volume.

In job order plants, the allocations of overhead costs to service departments and production departments, the reallocation of service department costs to production departments, and the applying of the overhead cost for production departments to production orders by means of overhead distribution rates were all examples of joint cost distributions. In plants or departments producing two or more products costed by means of the process cost accounting plan, the distribution of overhead costs to processes and the subsequent division of material, labor, and overhead costs among the several products obtained from the manufacturing process are strictly joint cost allocations.

Likewise, distribution cost accounting, which involves the allocation of selling expenses to sales departments, territories, salesmen, lines of

products, and sales orders, is primarily concerned with joint costs, their analysis, and application to cost units.)

The discussion of joint costs need not be limited to a special chapter, because the problems are daily ones for the cost accountant. However, since some industries encounter the problems of joint costs and by-products to a greater degree than others, some of their special accounting problems will be discussed in the present chapter, but no attempt will be made to delve into the complicated joint cost situations that arise in particular industries. (The problems encountered are so complex and so highly technical that their study has become a specialized branch of the general field of cost accounting. The specialized accounting procedures for handling joint costs are best studied in connection with conditions existent in industries such as oil refining, meat and vegetable packing, tobacco manufacturing, railroad operations, and the mining of precious metals, iron, ore, and coal. For example, in processing oil, there are obtained such important products as gasoline, fuel oil, lubricating oil, kerosene, paraffin, asphalt, and, more recently, synthetic rubber. Each product has its own price and marketing conditions.)

A Distinction between Joint Costs and By-products.—The differentiation between industries producing by-products and those producing joint products is a matter of degree. (If a firm is manufacturing or processing two or more commodities from one basic raw material and if one or more of these commodities are considered of less relative importance than the other or others, the firm is said to be producing under by-product conditions, and the commodity or commodities of less relative importance than the other or others are termed "by-products.") If, however, the products obtained are of relatively the same value, the firm is said to be operating under joint-product conditions, and the units of production are termed "joint-products." It is evident that the difference indicated is of a relative nature and that the accounting techniques employed may well be altered to fit the individual situation.

It is apparent that some of the problems of joint and by-product accounting may be encountered in the ordinary firm in the handling of scrap values. It is important, however, to realize that true scrap values often arise from incomplete or inefficient production but that by-products arise from purposeful and efficient operations. It is relatively easy for a firm to produce both joint products and by-products and to show the difference between these products by their treatment in the accounting system.

ACCOUNTING FOR JOINT COST PRODUCTS

Problems Involved in Accounting for Joint Costs.—Joint products arise when the processing of one or more basic materials yields a number of finished products, none of which is considered of relatively more impor-

tance than the others. In such case, as contrasted with by-products, the emphasis is not placed on any one product; the accounting methods employed attempt to analyze individual product costs by an allocation of the total common costs to the component units of each product derived.

The manufacturer of joint products is faced with the problem of marketing his various products, each of which has its own marketing problems and its own selling price, which are determined by the factors of supply and demand in a competitive market over which the producer seldom has direct control. The manufacturer is interested in obtaining the largest gross profit possible from the sale of each of his products and in increasing the output of the most profitable items, but he will continue to produce and market the other less profitable products since they absorb a share of the joint production costs, thus permitting a greater margin of profit to be made on the more favorable products. As a guide in planning his production and in marketing his joint products, it is necessary that he know as accurately as possible the relative share of the total costs of production that are attributable to each of the joint products.

Regular process cost accounting methods can be used to determine the total material, labor, and overhead costs of production up to the point where one or more products are separated from production and to compute the costs applied to each product from the point of "split-off" to the stage of completion. The principal problem in accounting for joint products is to determine the proportionate share of the total cost of production to the point of split-off that should be borne by the different joint products involved in the conversion process.

In general, there are three important methods of allocating the joint costs of production to the joint products:

a. The market price method, whereby common costs are allocated to the several commodities in proportion to the relative market values of the products obtained.

b. The unit method, whereby the common costs are distributed to joint products on the basis of the proportionate amount of common material in terms of pounds, tons, board feet, or gallons found in the ultimate products.

c. The survey method, whereby common costs are allocated to joint products arbitrarily after consideration of a number of important factors such as volume, selling price, technical engineering, and marketing processes.

Market Price Method of Allocating Joint Costs to Products.—Probably the most common method of apportioning joint costs to joint products at the point of separation is to divide the total costs according to the proportion that the total selling price of each of the joint products bears to the total selling price of all joint products. The method is based on the theory that products that have the highest selling price should bear the largest share of the common costs of production. It is used extensively by lumber mills, oil refineries, and similar industries in which it is

desirable to allocate material and other common costs on an easy and reasonably equitable basis in the absence of more exact calculations. The costs incurred in processing each product beyond the point of split-off are frequently deducted from the total selling price of each joint product before the computations are made. The method is illustrated by an example shown as Exhibit 62. In the illustration below, it is assumed that the total joint costs to the point of separation are $7 and that the basis of allocation is the proportionate amount of the market price of each product less its cost of manufacture beyond the point of separation

EXHIBIT 62
MARKET PRICE METHOD OF ALLOCATING JOINT COSTS TO PRODUCTS

Products	Market price of joint products	Cost of manufacture beyond point of "split-off"	Market price less cost of manufacture beyond point of "split-off"	Base of allocation	Joint cost apportioned to joint products
X	$ 3.00	$1.00	$ 2.00	1/7	$1.00
Y	4.50	0.50	4.00	2/7	2.00
Z	9.50	1.50	8.00	4/7	4.00
	$17.00	$3.00	$14.00	7/7	$7.00

from its joint cost stage of production. It is simpler but less accurate to use the actual market value of joint products as the basis for the allocation; the manufacturing and marketing costs beyond the point of separation are not considered.

The market price method presents a number of problems in the determination of relative selling values. Fluctuating market prices may complicate the procedure of computing the market values of each product and, as a result, it may be necessary to use an average market price each month for each product. In many cases the selling prices of products may not be an accurate indicator of costs incurred in their manufacture up to the point of separation; likewise, the selling prices may reflect in part the income received for costs applied to products subsequent to the division point rather than the cost of processing the original material found in products at the point of separation. The method is more accurate when relative selling values are determined as of the point of the division of the common materials into the joint commodities.

The inventory value of completed products consists of the sum of the allocated amount of the common costs made to the individual commodity plus the direct and distinguishable costs incurred in the subsequent processing of the product.

Other Applications of Market Price Method.—The use of the market price method of allocating joint costs to products is not restricted to manufacturing and extractive industries. Dairies frequently allocate joint costs of production to their several products, butter, cream cheese, cottage cheese, milk, buttermilk, and ice cream, on the basis of their selling prices or sales value.

Trucking companies may determine the profitableness of various classes of merchandise hauled by distributing total trucking costs to types of freight on the basis of rates charged.

In the development of a real estate subdivision or of a cemetery, realtors frequently allocate the total costs of developing the tract to lots upon the basis of their estimated sales value. Thus, as each lot is sold, its share of the total cost of the subdivision can be determined and a gross profit figure obtained.

Unit Method of Apportioning Joint Costs to Products.—This method provides for the allocation of the common costs of joint products to the respective units of production upon the basis of the physical volume of the basic materials found in the joint products at the point of separation. The unit of measurement varies with the types of products, but the more common units include pounds, tons, gallons, bales, and board feet. The method is illustrated in an example shown as Exhibit 63, in which it is assumed that the unit of measurement is gallons and that the joint costs

EXHIBIT 63

UNIT METHOD OF APPORTIONING JOINT COSTS TO PRODUCTS

Products	Yield, in gallons of products per 50 gal.	Percentage of gallons of joint products to total	Joint costs apportioned to products
X	20	40	$ 8
Y	5	10	2
Z	25	50	10
	50	100	$20

of production are $20 for each 50 gal. processed. When there is a loss of volume in processing, an allowance must be made through the distribution of the total waste or loss to the recovered products.

After the allocation of joint costs to the various joint products has been made, the direct items of cost can be determined for each product from the point of separation to the stage of completion. The inventory value is the sum of the allocated amount of the common costs made to the individual commodity plus the direct and distinguishable costs incurred in the subsequent processing of the product.

A criticism of this method is that the allocation of joint costs on the basis of volume or physical unit may give results inconsistent with actual conditions if the true allocation should be in proportion to the content and not to the quantity of the original materials found in the completed product. Under such conditions the solution lies in making the allocation on some weighted physical unit or volume basis.

Survey Method of Apportioning Joint Costs to Products.—The realization that there is no entirely satisfactory method of allocating joint costs of production to products manufactured simultaneously has led some manufacturers to adopt an arbitrary plan of apportionment, based upon consideration of all the important factors involved in producing and marketing the various products. The division of total joint costs among products arising from the conversion process is made on a percentage basis. The percentages are computed arbitrarily by the management of the enterprise, with the help of major department heads and technical advisors.

The plan is to make an extensive survey for the purpose of collecting information regarding all factors involved. The production departments obtain data regarding the volume of each product in terms of pounds, tons, or some common unit; the engineering and planning departments study the technical problems involved in the joint production; the sales division provides information concerning the selling price and marketing problems connected with each product; and the administrative division acquires data regarding the financing and administrative problems involved. The management considers the various factors involved and then prepares a schedule of percentages or weights in terms of points showing its appraisal of the proportionate amount of the total joint costs that should be borne by each product. The percentages or weights can be used period after period until there are changes in methods of production and sale or in selling prices.

An illustration of the method can be found in the canning industry.[1] Fruit for canning is generally purchased at a flat price per ton, but out of a ton of fruit will come many grades of finished pack. The cost of the raw product cannot be charged at a uniform price per pound to the various grades because the selling prices on the lower grades are not high enough to return the average price per pound on the fruit canned. Thus the better grades must be charged for more than average price to make up for the deficiency in the lower grades.

In determining proper grade differentials, the cost accountant must determine such factors as selling price of the various grades, size of cans, and mixtures of fruit and syrup, exemplified by combinations of peaches,

[1] BARR, R. H., "The Use of Standard Costs in the Canning Industry," *N.A.C.A. Bulletin*, July 1, 1941, pp. 1282–1298.

pears, cherries, pineapple, and grapes in a can of fruit cocktail. Arbitrary differentials are generally used in the industry. In the case of peaches, the differentials are: Fancy, 130; Choice, 115; Standard, 100; Seconds and Water, 75; and Pie, 50. Thus the total cost of the fruit is prorated over the entire pack so that the cost of Fancy grade will be 30 per cent more than Standard; Choice, 15 per cent more than Standard, etc. These differentials are generally applied to fruit delivered at the cannery and include the price paid to the grower plus freight, hauling charges, buying expenses, and receiving costs. Labor costs are charged to the various grades at a uniform price per pound, but overhead costs are generally allocated in proportion to the total direct costs, including labor costs, charged to the different grades.

The survey method just described is generally considered more equitable than either the market price or unit methods, because a combination of related factors is considered.

BY-PRODUCT ACCOUNTING

By-products are joint cost products that have a market value that is relatively unimportant in comparison with the selling prices of main products; consequently it is considered impractical to attempt to apportion to the by-products any part of the joint costs of production up to the point of split-off. If products have a relatively important selling price as compared with other products of the conversion process, such products should be considered as joint cost products and should receive a portion of the joint costs up to the point of split-off. By-products are substances such as steel filings, sawdust, scrap paper, bran, slag, and remnants of cloth. Daily or weekly, such materials are taken from production departments to stockroom or storage facilities in yards to await sale or consumption within the plant. Generally scrap materials are sold by the ton or bale, but occasionally such materials as shavings and sawdust can be used by the shipping department for packing purposes.

Two problems arise in regard to the proper handling of by-products: the problem of valuation and the determination of the account to be credited for the sales value. The market value is deemed to be the proper valuation for a by-product, because its cost cannot be determined. It is accepted as the correct value for inventory purposes by the U.S. Bureau of Internal Revenue. The market price of such materials is subject to daily fluctuations, and, since they may be sold weekly or monthly, it is advantageous to price a specific quantity at the average market price of such materials when a sizable quantity has been accumulated.

The accounting methods for handling by-product values may be classified as follows:

a. All income received from the sale of by-products is considered as other income. The major commodity bears all costs of production, and its sales yield the operating income.

b. The income realized from the sale of by-products is deducted from the cost of production.

c. The income realized from the sale of by-products, less both selling expenses incurred in the sale and manufacturing expenses applied to the by-products after they achieve a separate existence, is deducted from the cost of production of the major products.

In the sections that follow, only the essence of the different accounting methods is presented; in any given concern the method chosen is molded to the particular situation and is influenced by the cost of operating the system and by the type of information the management desires.

By-product Revenue as "Other Income."—If all revenue received from the sale of by-products is considered as other income, it is obvious that, for periodic statement purposes, the major product inventory values and the cost of goods sold figures are overstated and the operating profit is understated. The chief advantage of this method is that it is both easy and economical to operate. It is used most extensively in those firms where the by-products are unimportant, where the management's interest is in unit control and net results rather than in close analysis, or where a more analytical system is impractical.

The general ledger entry required to record the sale of by-products when they are considered as other income is as follows:

Cash or Accounts Receivable	xxx
Revenue from Sale of By-products	xxx

One of the outstanding difficulties with this method is in the valuation of inventories for balance sheet purposes. Normally no value is given to the by-product inventory, whereas the major commodity is shown at an inflated value. If this method is used, it is suggested that, for informational purposes, the by-product inventory should be listed in a footnote at its estimated selling price. Likewise, an analysis of conditions in a particular enterprise may disclose that the major commodity inventory may be overstated by more or less than the value of unrecorded by-products on hand, since either of the two products may have the faster turnover.

By-product Revenue as a Reduction in Cost of Production.—In job order plants, if the work in process involves large jobs from which are obtained by-products of considerable value, unquestionably the best method of accounting for the by-products is to credit the job with the estimated market value of the materials when they are taken to the stockroom or placed in storage. Exhibit 64 is an example of a by-product report prepared for a production department.

BY-PRODUCT REPORT No._____

Department No._____ Date_____

Production order No._____ Account credited_____

Stock account No.	Type of material	Quantity	Description of condition	Estimated unit value	Estimated total value

Returned by_____ Received by_____

Exhibit 64.

The proper entries are as follows:

Entry in general ledger:
Materials (or By-product Inventory).....xxx
Materials in Process.....xxx
Entry in subsidiary records:
Quantity and market value recorded in the received section of the stock ledger accounts for by-products; entry in the proper production orders as a credit to the material cost of the orders.

The above method is frequently not practical because it is impossible to determine the production orders from which the scrap was obtained. In addition the quantity of materials and the value may be so small that accounting for it in terms of each job is impractical.

A second method, which consists of treating the value of scrap materials as a reduction of general overhead costs, is favored more frequently. It is good accounting theory to consider any revenue obtained as a by-product of manufacturing operations as a reduction in the cost involved in the processing. Since the residual value cannot be attributed to a particular job, the next best treatment is to reduce the overhead costs of all jobs responsible for the scrap materials. According to this plan the entries required are as follows:

Entry in general ledger:

Materials (or By-product Inventory)	xxx
Factory Overhead Expense	xxx

Entry in subsidiary records:

Quantity and market value entered in the received section of the stock ledger accounts for by-products; entry in the standing order for by-products as a credit to the production departments responsible for the accumulation of scrap materials.

An advantage of the method is that the Factory Overhead Expense account need not be credited until the end of each accounting period. Thus it is possible to carry only the quantity to the stock records for by-products and to delay pricing the material until it is actually sold. The credit entry to the Factory Overhead Expense account can be made monthly for the exact amount received from the sale of by-products.

If a process cost system is used in an industry, the value of by-products may be credited to the process or operation responsible for their existence, since the value of such residues are a legitimate reduction in the operating costs and average unit costs of the process or operation. However, this method may not be accurate in many instances, because the material costs may have been charged to processes or operations that preceded the processing that produced the by-products.

By-product Revenue, Less Selling and Manufacturing Expenses, Deducted from Cost of Major Commodity.—A number of different situations may exist in the production of by-products. In some firms the by-products are ready for sale at the moment they achieve a distinct existence, but in other concerns they are subjected to further processing before their ultimate sale. The third method illustrates a system for by-product accounting in which, after a certain stage of production, the direct materials and labor applied to the by-products can be ascertained. Under this method the manufacturing costs are applied after by-products assume a separate existence, and the selling expenses incurred in their sale are deducted from the selling price of the by-products; the balance remaining is deducted from the cost of the major commodity. The calculation of the cost of the major commodity product is as follows:

Statement of Manufacturing Costs for Major Commodity

Materials	$30,000
Labor	20,000
Overhead expense	25,000
Cost of production to point of split-off of by-products	75,000
Less: Net yield from sale of by-products (schedule A)	4,700
Net cost of major commodity at point of split-off	70,300
Add: Expenses on major commodity after split-off:	
Material	1,000
Labor	5,000
Overhead expense	5,000
Net cost of finished major product	**$81,300**

SCHEDULE A

ANALYSIS OF REVENUE FROM SALE OF BY-PRODUCTS

Sales of by-products			$20,000
Cost of production subsequent to split-off:			
Material	$5,000		
Labor	8,000		
Overhead expense	2,000	$15,000	
Selling expenses, by-products		300	15,300
Net yield from by-products			$ 4,700

The logic of the general method is based upon the concept that the selling values of by-products are often indicative of their actual cost, in terms of production costs, and that the deduction of this net yield from the cost of the major commodity does, to a rather accurate degree, indicate the true cost of the major commodity alone. Those who oppose this method contend that the selling price of by-products is subject to a supply-and-demand determination of its own, which exists quite apart from that applicable either to raw materials or to the major commodity. In this respect it is suggested that the relative bargaining position of the firm in the sale of by-products may have an unwarranted reflection in the calculated unit costs of the major commodity. In cases where by-product selling prices fluctuate widely, this is a just criticism.

Questions

1. Differentiate between industries producing joint cost products and those producing by-products. Give two illustrations of joint products and three illustrations of by-products.

2. What are the important problems involved in accounting for joint costs?

3. Explain and illustrate the market price method of allocating joint costs to products. What variations can be made in the application of this method?

4. What is the unit method of apportioning joint costs to products? What are the common units used in the computation of costs? How is a shrinkage in the number of units or loss of volume treated when the unit method is used?

5. Why is the survey method considered more equitable than either the market-price method or the unit method?

6. What problems are involved in accounting for by-products?

7. Explain three methods of accounting for by-products.

Problem 1

The Sally Ann Dress Co. manufactures inexpensive street and house dresses, both of a seasonal and standard pattern. Dress models are designed by the planning department and are manufactured in lots of 50 doz., a production order being used to accumulate costs for each lot. The production manager is concerned about determining unit costs for each order because approximately 10% of the dresses in each order are classed as "seconds" and 2% are considered as "rejects" by inspectors.

Production order 1060 may be considered typical of production conditions. The order schedules production of 50 doz. Model X dresses for which the following costs are accumulated: direct material, $660; direct labor, $480; and factory overhead expense, $240. Sixty dresses were classed as seconds and 12 dresses as rejects by

inspectors. The first-line dresses sell to jobbers for $60 per dozen; the seconds sell for $36 a dozen; and rejects are valuable only as scrap material at a value of approximately $2 a dozen.

These conditions are considered normal by the management, but the company is periodically faced with labor troubles, during which inexperienced cutters and sewers are used. During these temporary periods, seconds frequently amount to 30% and rejects as high as 10% of the total production.

You are asked to advise the management on the following:

a. How the unit cost of firsts, seconds, and rejects should be determined so that the profit for each order and for each class of products can be computed.

b. How costs for each order and for each class of products should be determined during abnormal conditions of production caused by strikes.

Problem 2

The total cost of developing the Ocean View subdivision is given in the schedule below:

Tract of Land		$3,000.00
Improvements:		
Sidewalks	$ 600.00	
Sewers	1,750.00	
Paving	2,050.00	
Landscaping	350.00	4,750.00
Supervision cost		250.00
Total cost		$8,000.00

The tract of land is divided into 12 lots numbered from 1 to 12, with an estimated selling price fixed on each one according to frontage, location, and improvements as follows:

Lot No.	Selling price	Lot No.	Selling price
1	$1,800.00	7	$ 1,900.00
2	1,200.00	8	1,350.00
3	1,500.00	9	1,700.00
4	2,000.00	10	1,650.00
5	1,550.00	11	1,900.00
6	1,450.00	12	2,000.00
			$20,000.00

During the month of July three lots, 1, 3, and 7, were sold.

a. Prepare a comparative statement as of July 31 exhibiting the costs, classified as to land, improvements, and supervision, the selling price, and the profit on each lot sold during July.

b. Show computation of the inventory value of the seven remaining lots as of July 31.

Problem 3

The Bloger Clay Co. operates an open pit from which No. 2 plastic clay is excavated. The deposit underlies an overburden of 10 ft., 6 ft. of which is a lignite formation which has a local market as cheap industrial fuel.[1] The company sells the lignite as a by-product in order to help pay for the costs of removing the overburden. The accounting system deducts the revenue received from by-products from the value of the main product in order to derive the cost of the major commodity.

From the following information, determine the closing inventory as of Dec. 31, and submit a statement of manufacturing costs, a statement of cost of goods sold, and a profit and loss statement.

Jan. 1 inventory of No. 2 plastic clay: 2,000 tons @ $3 per ton.

Production of clay for the year, 8,000 tons. The company pays an independent contractor 63¢ per ton to move the overburden. Total overburden was 7,000 tons, of which 4,000 was lignite which was sold for 40¢ per ton and moved by the buyer as soon as excavated.

The laborers who dig the clay receive 70¢ per ton. Royalties paid amount to 50¢ per ton. The depreciation on storage bins and administrative and other expenses amounted to $1.15 per ton of clay mined during the year. Sales amounted to 8,500 tons @ $5.00 per ton.

Problem 4

The X Chemical Co. produces commodities P and R as joint products and product Z as a by-product. The accounting system deducts the net revenue from the sale of Z, less selling expenses and manufacturing expenses directly applied to Z, from the cost of P and R at the point of split-off. The common selling expenses are allocated to P, R, and Z upon the basis of the gross sales of each. Manufacturing expenses to the point of split-off of P, R, and Z are allocated to P and R on the basis of the average sales price of these products.

Average selling price of P, $1.00 per unit.
Average selling price of R, $2.50 per unit.
Average selling price of Z, $0.25 per unit.
Gross sales of P, $10,000.
Gross sales of R, $20,000.
Gross sales of Z, $1,000.
Total selling expenses, $3,100.
Manufacturing expense to split-off, $14,400.
Manufacturing expense applied directly to P, $ 7,500.
Manufacturing expense applied directly to R, $15,000.
Manufacturing expense applied directly to Z, $ 500.

Inventories	P	R
Beginning inventories	$5,000	$8,000
Ending inventories	7,000	5,000

Prepare a profit and loss statement with supporting schedules.

[1] Overburden refers to the material which must be moved in order to excavate deposits in open-pit mining operations.

Problem 5

The Pete Lumber Co. manufactures oak flooring. The company buys logs f.o.b. the sawmill. The products are flooring in 2- and 4-in. widths. From the sawdust a sweeping compound is made. The two types of flooring are joint products and the sawdust is considered a by-product. The net revenue of the by-product less direct manufacturing expense is deducted from the cost of the joint products at the point of split-off to determine the joint-product costs.

From the following hypothetical values prepare a statement of manufacturing costs:

Logs purchased, $3,000; logs unused, $500.

Production: 2-in. width, 100,000 ft.b.m.; 4-in. width, 80,000 ft.b.m.

Sawdust accumulated, 10,000 lb.; revenue from sawdust, $500.

Overhead expenses to point of split-off:

Power expense	$1,000
Depreciation expense	500
Indirect labor expense	2,500

Direct oil expense applied to sawdust, $230.

Direct expense applied to 2-in. width, $1,000.

Direct expense applied to 4-in. width, $1,500.

The common expenses to point of split-off are allocated to joint products on the basis of board feet.

Problem 6

The superintendent of a cheese manufactory reports the following results of a test run:

46,153 lb. of milk was purchased at the contract price of $3.10 per cwt., on the basis of a butter-fat content of 3.5%, with a premium or discount of 4¢ per cwt., on account of variations from the standard, the total cost being $1,647.66. From this milk, 5,976 lb. of cream, having a butter-fat content of 20%, was sold at a price of 58¢ a pound of butter fat, the remainder yielding 4,491 lb. of uncured cheese, known as No. 1.

The whey from the milk used weighed 29,280 lb., to which was added 1,384 lb. of whole milk from the purchases of the following day, the combined fluid yielding 1,821 lb. of uncured cheese known as No. 2.

The No. 1 cheese is subject to a shrinkage of 12.3% in curing, and the No. 2 to a shrinkage of 33%.

From the foregoing data, determine the material cost per pound of cured cheese and the yield per cwt. of milk.

For this purpose, you may assume the value of whey to be 50¢ per cwt., and the price of the whole milk used in the process of the second day the same as that used on the first day.

(American Institute of Accountants November, 1932, Part I, No. 5.)

Problem 7

The following data are furnished by the Red Desert Copper Co. concerning the current year's sales and operations at its mine and smelter:

Inventories at the beginning of the year:		
Ore—valued at book cost, which includes depreciation and depletion		
100,000 tons at $2.80 per ton		$ 280,000
Copper—likewise valued at book cost, 30,000,000 lb. at 9.8¢ per pound		2,940,000
Production costs, including depreciation but before depletion:		
Ore—2,500,000 tons at $2.052 per ton		5,130,000
Smelting cost—1.5¢ per pound of copper produced, including cost of transporting ore from mine to smelter		
Yield—30 lb. of copper per ton of ore		
Inventories at the end of the year:		
Ore	600,000 tons (all at mine)	
Copper	20,000,000 lb.	
All sales of copper at 11¢ per pound		
Ore reserves at the beginning of the year:		
Per books—10,000,000 tons, carried at $8,000,000		
No new ore deposits were purchased during the year		
Ore reserves at the end of the year:		
Per engineer's survey—13,400,000 tons		

Prepare the following statements showing both quantities and unit costs, computed on three alternative bases of valuing inventories, consistently applied throughout the problem:

a. Cost of ore mined.
b. Cost of copper sold.
c. Gross profit on copper sol

(American Institute of Accountants, May, 1940, Part I, No. 2.)

Problem 8

From the following data prepare a statement of operating results of the Zinc Mining and Milling Co. in October that will show the operations on the company's own account and its activities in furnishing milling services to others, both for zinc and for lead concentrates. Present all supporting schedules. Carry computations to the third decimal.

The Zinc Mining and Milling Co. operates several mines and a mill for concentrating ore. The ore as it comes from the mines must be concentrated in the mill before being shipped to the smelters. The resulting zinc and lead concentrates amount to about 5 to 7% of the original weight. Both kinds of concentrates go through substantially the same milling processes. Zinc concentrates contain about 60% zinc, and lead concentrates contain about 80% lead.

The company, in addition to milling the rock produced in its own mines, does commercial milling for other mines in the neighborhood, accepting as compensation 20% of the concentrates produced. The amount of concentrates produced from the ores thus brought in is determined by assaying each carload of rock as it is received. This is necessary because (*a*) the ores from different mines differ in richness and (*b*) it is not practicable to mill different batches of ore separately.

The mining land and ore deposits are not owned by the company. A royalty of 12% of the selling price of concentrates produced from company ores must be paid to

the owners. This royalty accrues as the concentrates are sold, royalty expense being charged and accounts payable credited at the end of the month in which sales are made.

The company develops its own power, which is used 40% for mining operations and 60% in the mill.

Inventories of partially mined rock and of rock in process in the mill are constant and may be ignored for the purposes of this problem.

The following operating data are presented:

Cost of mining	$31,356
Cost of milling	11,326
Cost of power	6,292
General management	5,586
	$54,560

(The foregoing costs include all labor, supplies, expenses, and depreciation.)

	Tons	Valued At
Mined rock on hand October 1st	500	$ 615
Rock mined and brought to the surface in October	27,600	
Mined rock on hand Oct. 31	1,500	
Rock owned by others milled in October	4,600	
Concentrates on hand Oct. 1:		
Zinc—own product only	150	$ 3,900
Lead—own product only	50	1,800
Concentrates produced in October, both own and for others:		
Zinc	1,810	
Lead	187	
Concentrates delivered to others after retaining company's share:		
Zinc	216	
Lead	24	
Concentrates on hand Oct. 31:		
Zinc—own product only	125	
Lead—own product only	20	
Sales of concentrates in October:		
Zinc		$66,379
Lead		11,001
Market price per ton of concentrates Oct. 31:		
Zinc		$ 42
Lead		58

It is understood that the mining and milling expenses will be apportioned to the cost of zinc and lead concentrates on the basis of their sales value (known as the "joint-product method") and that the general-management expenses will not be absorbed in the production costs.

(American Institute of Accountants, May, 1941, Part I, No. 2.)

CHAPTER XVI

STANDARD COSTS: MATERIAL, LABOR, AND OVERHEAD

The use of standards is not a newly created device. For many years the underlying principles of standard costs have been a part of the efficiency plans of production engineers, especially in setting piece-rates through the aid of time and motion studies. Sales quotas, advertising appropriations, and allotments for various classes of expenses may be classed as types of standards which have been used to measure efficiency in the sales and administrative divisions of many concerns. Cost accountants have used methods akin to standards in the job order cost accounting system in the development of a normal overhead distribution rate or departmental rates for the purpose of avoiding seasonal fluctuations in actual overhead and production conditions in the allocation of overhead to production. The new era of popularity of standard costs has been due to the success with which standardization has been applied to all elements of a business.

Standard costs are not distinct systems of accounting. They may be used either with the process or operation type, or with the job order type of cost accounting system. They may be developed for the sales and administrative division, for materials, labor, or overhead or for all elements of cost. The value of the system usually increases as more costs are standardized.

Defects in Actual Cost Methods from Point of View of Management. From the point of view of management, there are three important defects in the older types of cost analysis: the importance attributed to actual costs, the historical aspect of the cost figures, and the high cost of compiling actual costs. Management is led to believe that actual costs are the result of efficient operation, when in reality actual costs may include excessive quantities of material, defective parts, ineffective use of labor, and an unnecessary amount of time in production. In other words, the cost analysis may not be an indicator of efficient plant operation. In addition to actual costs, management needs a means of appraising or measuring the efficiency with which materials, labor, and overhead are combined in the finished product. A means of measuring efficiency is found in the form of standards. Historical costs are a material aid to plant management, but, in many industries where price lists,

bids, and production plans must be formulated far in advance of actual production, historical costs are obtained too late to be of maximum value. Therefore predetermined standard material, labor, and overhead costs are an important aid in formulating price policies, in planning production, and in measuring operating efficiency.

The older types of cost systems entail the use of subsidiary records which may be voluminous and may require the time of a large number of clerks. The cost of operating such systems may be too great for many business enterprises which welcome a reduction in the cost of cost accounting frequently made possible by the introduction of a system of standard costs.

Definition of Standard Costs.—Standards are predetermined costs which are used in measuring productive efficiency and which are used periodically as a basis for comparison with actual costs. Standard costs are not permanent costs and are subject to revision from time to time. They may be characterized as "common-sense costs"; figures which reflect the best judgment of management as to what costs ought to be if the plant were operated with a high degree of efficiency with the standards for material, labor, and overhead set so as to be possible of attainment. A definition will be ventured.

The standard cost of a product may be defined *as predetermined costs, based upon engineering specifications and representing highly efficient production for quantity standards and forecasts of future market trends for price standards, with a fixed amount expressed in dollars for material, labor, and overhead for an estimated quantity of production.* The important thing that should be noted, before a detailed analysis can be made of the proper method of determining standards, is that there are two groups of standards: price standards and quantity standards, and for each element of expense, whether material or labor or overhead, the "variance" between standard and actual at the end of each accounting period is explained by both quantity and price differences. Engineering specifications are the basis for quantity standards for material and for time standards for labor, while budget forecasts are of primary importance in determining material price standards, labor rate standards, and overhead standards. The estimated quantity of production for the period must be considered since it is an important factor in determining the standard overhead rate for the period. Standards are generally detailed to show estimates for each element of cost, for each production center, for each operation, and, in some enterprises, for each machine.

The determination of price standards is predicated on the ideas that market prices for materials, labor, and indirect services classed as overhead can be forecasted for the ensuing period and that the required quantities of these requirements can also be foretold. Therefore care-

fully prepared budgets form a necessary element in the preparation of such standards. The determination of quantity and time standards is largely an engineering problem in which budgets are of value only indirectly in that they supply estimates of the quantity of goods expected to be produced.

Advantages of Standard Costs.—Among the many advantages generally attributed to the use of standard costs, the most important may be stated as follows:

a. Standard costs are a valuable aid to management in formulating price and production policies.

b. Quantity and time standards are a constant unit of measurement by which management is enabled to gauge the operating efficiency of employees and of production centers during different periods of time.

c. Standards make possible the application of the "principle of exception," which means that the attention of management is centered primarily on cases of below- and above-standard performance.

d. Standards are important as incentives to workers, supervisors, and executives.

e. Standards are an economical means of cost accounting and generally result in a saving in the cost of cost accounting.

Value of Standards in Formulating Price and Production Policies.—In mass-production plants which produce quantities of standard and uniform products, standard costs for material, labor, and overhead are determined in advance of the accounting period. In job order plants, standards are computed in advance of the accounting period for parts and processes which are uniform before production is started for products fabricated according to special specifications. In either case, standard costs are predetermined costs which are a material aid to management in determining price policies, preparing bids for prospective orders, planning production of new products and new styles, and furnishing cost estimates, all of which enable the sales department to push lines of products with the greatest margin of profit. The file of standard cost cards constitutes an excellent source of reference for both major and minor executives.

Standards as a Constant Unit of Measurement.—The older forms of cost systems provide actual costs of a particular accounting period which are compared by executives with reports of costs of past periods; the cost differences between periods are the only means management has for comparing the efficiency of plant operations. There is no unit of measure, no constant base to which a period's costs can be compared and by which their operating efficiency can be judged.

When a standard cost system is in use, standards of material quantities, labor time, and machine time are set for each product, each production center, and each machine. If the standards are correctly

determined, they may exist without revision from year to year, bridging accounting periods and making possible the comparison of the actual costs of each period with standards so that the efficiency of each worker and production center may be appraised. Quantity and time standards need never be revised unless there are changes in the products, methods of production, machines, type of labor, or quality of materials used. Thus such standards provide a constant and unchanging unit of measurement. Price standards, however, are subject to periodic revision. Generally, standards of all types should be used for the longest period possible in order that executives, whose duty it is to prepare reports and to analyze costs, may not be confused and may have a better basis of comparison.

The Principle of Exception.—In large plants or in manufacturing divisions which have a large number of workers and operations, it is difficult for executives and supervisors to analyze and weigh the efficiency and productivity of individual workers and machines. Management has come to realize the economy of both supervisory time and effort in the use of the "principle of exception," which is considered to be an important advantage of standard cost systems. The principle of exception assumes that actual performance which meets the standard time or rate is satisfactory and that only those activities which fail to come up to standard or which exceed standard are worthy of executive attention. Thus the attention of management may be focused on important cases of exception from standards; operations which meet the standard, or which approach standard performance so closely that the variances are negligible, may be ignored. Daily reports of labor and materials can be so arranged that the foreman of each production center and the supervisor of each department can see off-standard conditions and can investigate excessive costs before they have continued for any length of time.

Standards as Incentives to Personnel.—If standards are reasonable and possible of attainment, they act as incentives to employees to increase their volume of production and to maintain the quality of the product. Each worker undertakes his assignment with advance knowledge of the standards set for the particular job; he knows that, if his work falls short of the standard, he must account to his supervisor or foreman for the variance and give a reasonable explanation for its existence. Unquestionably workers tend to work more efficiently, supervisors and foremen have a greater interest in the accomplishments of their departments or operations, and executives analyze more closely the productivity of their divisions when standards are used as a means of measuring the results of the activity of each employee and division.

Many plans for rewarding workers, supervisors, and executives for equaling or surpassing standard performance are in use. Cash bonuses,

prizes, vacation time, and promotions are among the methods of reward frequently employed. If workers are to be penalized or criticized for below standard work, it is essential that they should be given a suitable recompense when standards are equaled and passed.

Standards an Economical Means of Costing.—An advantage generally attributed to standard costs is the economy of its operation. The use of standards results in a saving of accounting and clerical personnel in two ways. First, detailed subsidiary records in the form of production orders and daily time reports may not be used because the total actual costs are compared with the standard costs at the end of each accounting period. Second, even though the concern uses subsidiary records and reports dealing with daily production, standards make possible the use of standard forms for production orders, material requisitions, and time sheets so that standard costs for material, labor, and overhead for each operation and department can be inserted in the standard forms before production is begun.

Standards and Accounting.—Standards for material, labor, and overhead may be purely statistical devices used by management as predetermined cost information without their ever being compared with actual operating costs. Some concerns use standards exclusively in this manner without employing any form of historical cost system to test the correctness and adequacy of the standards. Such methods may be criticized as being unreliable, unsound, and misleading as management tools. It is only when standards are used in connection with a reliable historical cost accounting system that an effective control of costs is created.

Standard costs may be employed in connection with either the process cost or the job order type of cost system. The former is more generally used because standards have been more readily adaptable in mass-production plants with an output of quantities of uniform and standardized products or of parts for which standards may be set in advance of the accounting period. The process cost system accumulates total material, labor, and overhead costs at the end of each accounting period for each department, operation, or product so that a comparison can be made between total standard costs and actual costs. The process cost system is relatively inexpensive to install and to operate, and, when standards are used in connection with it, the most inexpensive form of standard cost accounting results.

Special-order industries may also use standards in connection with a system of job order cost accounting although such enterprises generally encounter a higher cost in preparing standards which must be formulated or revised to fit the needs of each new type of production or job. The daily accumulation of actual costs in production orders is an expensive

process, so that the use of standards in conjunction with job order cost accounting may entail too great an expense for some enterprises. However, the results of such a combination are frequently so effective an aid to management that its value is greatly out of proportion to its cost.

Budgets and Standards.—Standards have been ably discussed from both a managerial and accounting point of view in current books and periodicals, but one important consideration has not been given adequate attention. The part that budgets and systems of budgetary control play in the development and operation of standards is important enough to deserve careful consideration. In fact, the statement can safely be made that budgeting must precede the accurate and effective determination of price standards for material, labor, and overhead and that, conversely, a plan of budgetary control is more successfully installed in concerns having standardized production processes and operating under standard cost accounting systems. Budgetary control and standard costs are inseparable, and each is an important adjunct to managerial planning.

Organization of the Plant.—Before a standard cost system can be operated efficiently, it is necessary that the plant be so organized that lines of authority are properly defined and departmentalization is clearly designated. Each worker should be informed, by means of standard cost cards, charts, or blackboard reports, of the quantity of material and labor time set as standards for his particular operations so that he may be held responsible for off-standard results. If groups of workers are responsible for a single operation or process, the group should be made responsible for below-standard production. The foreman of each group of operations or workers is responsible for efficient production, and he must explain off-standard results to his immediate superior, who is usually a department executive. Thus the superintendent of the plant, the department executives, the foremen, and the workers are all held responsible for excessive use, waste, and spoilage of materials, for idle time and labor time in excess of standard, for unused machine and plant capacity, and for overhead expenses in excess of standard budget requirements. Each person must achieve the standards set for the functions and responsibilities which have been assigned to him. The responsibility must be made absolute, as in an army organization, with mutual cooperation existing through the entire organization, from the superintendent to the lowest paid workers. The goal is efficient plant operation, which is signified by the attainment of standards. A series of daily or weekly records showing comparisons between standard and actual performance are the best means of informing executives and supervisors of the progress of plant operations so that they can advise and instruct

workers in order to enable them to attain standard performance in their respective duties. Wall charts and blackboards are used successfully in some plants to supplement more formal reports.

Simplicity of organization, carefully defined cost centers, strict allocation of duties, and a system of reports are the prime factors in devising a suitable layout for the introduction of standard costs.

Engineering Specifications and Production Plans.—The starting point in the preparation of material quantity and labor time standards is the careful analysis of the engineering specifications, mechanical drawings, and lists of parts used in the assembly of the product in question. A knowledge of quantity, type, and size of each class of material, of the nature of each labor and machine operation, and of the various types of assemblies can be secured to form the basis for the careful testing of material quantities and the making of time and motion studies required in determining standard costs. The advice and aid of employees in such technical departments as the various mechanical, electrical, and chemical engineering departments are invaluable in determining quantity and time standards.

Past Cost Records an Unreliable Factor in Determining Standards.—Records of costs representing periods which predate the standard cost system should not be relied upon as a basis in determining standards, because they incorporate the inefficiencies and wastes that the standards are expected to uncover and to prevent or to minimize in the future. The records of past costs should be scrutinized only for the purpose of ascertaining the methods of production, the various operations, the record of defective parts, the waste of material, and the idle time which may be considered a normal condition of operation and which cannot be prevented. For example, in a woodworking shop a certain portion of material is waste regardless of the efficiency with which the mill is operated. A similar condition exists in the clothing industry, in which scrap materials result in spite of the care taken in designing and cutting. Waste that cannot be prevented is generally included as an element of cost in setting standards.

Standard Cost Cards.—The file of standard cost cards or sheets constitutes an important part of the standard cost system since it is this record which is used by management in formulating price policies, preparing price lists, quoting special prices, planning production, and analyzing marketing possibilities. The type of standard cost card used varies with the requirements of the individual firm; hence no uniform form can be presented. A simple type is illustrated as Exhibit 65.[1]

[1] "Cost Accounting Through the Use of Standards," p. 18, Department of Manufacture, Chamber of Commerce of the United States.

STANDARD COST SHEET

No. 146

ARTICLE 6-8 Box
DRAWING A-7862

Date
Figured: 12/4/A.B.D.
Revised
Revised

	Item	Quantity	Cost per unit	Extension	Revisions		
					Extension	Extension	Extension
Material	Material A	50 lb.	$0.60	$30.00			
	Material B	10 lb.	2.00	20.00			
	Total material cost	x	x	$50.00			
Direct Labor		Hours	Rate				
	Dept. A	4.0	$0.50	$ 2.00			
	Dept. B	12.0	0.90	10.80			
	Total labor cost	x	x	$12.80			
Overhead		Direct labor	Rate, per cent				
	Dept. A	$ 2.00	80	$ 1.60			
	Dept. B	10.80	140	15.12			
	Total overhead cost	x	x	$16.72			
	Total standard cost	x	x	$79.52			

Exhibit 65.

A card may be prepared for each product to show the quantity and price of each class of material required, the class of labor, the labor time and rate, the overhead time and rate, and the total of each element of cost for each operation or department. An alternative is to use a separate card for each part manufactured, with cards showing various assembly costs, so that the total standard cost of a product is obtained by adding together the costs on cards for parts and assemblies comprising the finished product.

Standard cost cards are generally arranged in such form that they may be revised from time to time and that the revisions can be shown in columns adjoining the column containing the original standard estimates.

Standards for Materials—Quantity.—In the case of materials the goal is to set a standard material cost per unit, a computation which involves a complete list of the material used and the standard quantity multiplied by the standard price of each part. Apparently writers have in mind quantity standards when they consider standards to be of a fixed and unchanging character. Material quantity standards are based upon engineering specifications, verified by chemical and mechanical analyses or by test runs. Drawings, blueprints, and designer's specifications may be used as the basis for obtaining a list of the parts, the weight of materials, and the quantity of each liquid to be included in the product. Mathematical calculations or chemical and mechanical analyses should be made for each part or process, and test runs of production should be made. Generally the procedure is repeated several times on different days for each product, and the results are compared so that unusual circumstances will not improperly color the computations. There are no budget elements involved in setting material quantity standards, and the problem is largely one of engineering rather than of management.

H. J. Myers, comptroller,[1] U.S. Radio and Television Company, describes tersely the process of obtaining quantity standards for materials by means of a hypothetical case, the manufacture of a simple type of packing case, illustrated as Exhibit 66:

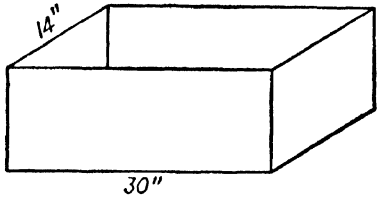
> Standards of material should be based on the quantity of pieces, pounds, feet, yards, etc., required to make the article desired and should include normal waste. It should not include allowances for poor material, or for carelessness in handling or workmanship which would cause an undue amount of loss of material, because it is these very things that we want a standard to show up. If we tried to anticipate these losses and allowed for them we would not have any means of bringing these undue losses to the attention of the management.

[1] MYERS, H. J., "How to Set Standards," pp. 3–5, National Association of Cost Accountants, New York.

Standards should not be based on past performance but on an analysis of the product and what it requires. Variations from these requirements should show up regularly as variances from standard. When they do, the management can stop them before they have gone far enough to cause serious loss. . . .

The first thing to determine in this case is the standard material required. This box is analyzed into its parts, part numbers assigned and number of parts required listed below the box. The chart below shows how the standard quantity is arrived at for each piece. The first three pieces are made from lumber. There is a normal waste allowance of 25% added. This 25% is arrived at from a study of usage, taking the standard grade of lumber specified and average conditions.

EXHIBIT 66
COMPUTATION OF STANDARD COSTS OF A PACKING BOX



Any waste in excess of this figure shows up as excess usage—a variation from standard.

The fourth item is nails. There is no allowance for waste here because there are just twenty-four nails required and there is no need for using more than this quantity. If some are spoiled or lost by the workman, he must get more to complete his job and charge it up to excess usage. This same principle applies to purchased parts, screws, bolts, nuts, washers, or any other item which can be stored.

If the first three parts were purchased from a dimension stock mill instead of cut from lumber, this same principle illustrated in the case of the nails would apply. For instance, the box requires two sides, two ends and one bottom. These parts would be standard quantities, and if one is split, broken, or for some other reason required replacement by another of the part, the replacement likewise would be excess material.

PACKING BOX—PART A
Kind of Material—¾ and ¼ Pine S2S. Standard Price $30.00 M Feet
Packing Box Size—30″ long × 14″ wide × 12″ high.
(Inside Measurements)

A—Assembly (Box Complete)

	Std. Unit Cost	Total Cost
A1—Sides 12″ × 32″ × ½″—2 Pcs	$0.1068	$0.2136
A2—Ends 12″ × 14″ × 1″—2 Pcs	0.0468	0.0936
A3—Bottom 15″ × 32″ × 1″—1	0.1332	0.1332
A4—Nails 6 Penny —24	0.0080	0.0080
		$0.4484

How Unit Cost of Each Part Is Determined

Part No.	Name	Kind of Material	Size	Qty. Per Piece ft.	Normal % of Waste	Std. Qty.	Std. Price M	Unit Cost
A1	Sides	¾ Pine Crating	12 × 32 × ½	2.67	25%	3.56	$30.00	$.1068
A2	Ends	¼ Pine Crating	12 × 14 × 1	1.167	25%	1.56	30.00	.0468
A3	Bottom	¼ Pine Crating	15 × 32 × 1	3.33	25%	4.44	30.00	.1332
A4	Nails	6 Penny		#.24	None	#.16	#.05	.0080

Standards for Materials—Price.—The determination of price standards for material is a distinctly different problem, one which is based upon executive judgment and fortified by a system of budgetary control and forecasting. Material prices manifest wide and persistent fluctuations, even for standard products such as steel, copper, and lumber, and to use for period after period a standard price for materials which is above or below the actual market price seems to be a most confusing and unreliable barometer of costs.

A more practical solution to the problem of setting price standards for material is to consider the present prices of various grades of material, the economies realizable by quantity buying, and the probable market tendencies for a definite future period of time, in most cases for the budget period. The standard material prices should be changed at the beginning of each budget period to coincide with the estimated requirements and with the market conditions for the ensuing period, and the predetermined standards should remain in force for the entire period. The standards should be based upon the most efficient conditions of purchasing, transportation, and handling, but they should be possible of attainment.

The standard cost of material should include the price paid to the vendor after deducting both trade and purchase discounts, to which should be added freight charges, cartage, receiving and testing costs, insurance, and storage charges.

Conditions vary in different companies, but two distinct groups of raw materials are usually purchased. One group includes semiprocessed or completed parts which are either further processed or are used in assemblies in the finishing departments. These parts are purchased according to standard specifications. They are contracted for some time in advance and usually are not susceptible to current market price changes. The production budget should exhibit the expected production

of finished products, classified by units and classes of products for the budget period. These estimates, combined with the standard material requirements for each unit of the product, should give the purchasing department adequate information as to the quantity of each class of material needed for the budget period. The actual contract price per unit plus an estimated amount of freight, receiving, handling, storage, and purchasing cost should constitute the standard price of each unit of material for the period.

The preparation of standard prices presents greater difficulties in the case of materials in the second group, which includes standard raw materials bought in the open market and susceptible to almost daily fluctuations in market prices. It is frequently contended that standard prices for materials in this class should be built up by an analysis of the market for a past period covering at least one complete business cycle and that the average price of that period should be established as standard. Instead, a careful analysis should be made by the statistical and purchasing departments of the existing market conditions and of the expected trend of market prices during the next budget period. It may be that a series of expected prices, either upward or downward may be computed, in which case the average of the estimated net prices for each class of purchases should be established as a standard to which could be added the applied receiving, handling, and purchasing costs to obtain the final standard for the period. The standard price for each class of materials should be used without revision during the budget period, and for a longer time if market prices have not changed appreciably.

Standards for Labor—Time.—The problem in establishing standard labor costs is to develop, for each product manufactured, a standard cost sheet showing the standard time for each operation multiplied by the standard rate to be paid. The determination of efficient standards has attained a higher degree of success in the case of direct labor than in either material or overhead because of time- and motion-study methods, minute division of labor, and scientific wage schemes in manufacturing plants.

The most common method of setting time standards for labor is to use a stop watch in making time and motion studies of each operation required in the production of a part or of a product. The standard time for each operation should include any necessary waste motion and idle time, but, if it is to be a proper means of measuring productive activity, all forms of inefficiency in the use of the time factor must be eliminated.

Mr. Myers continues in his discussion of the determination of standards for the manufacture of a packing case, referred to on page 304, by presenting the following discussion dealing with labor standards and a schedule of standard cost computation, Exhibit 67:

EXHIBIT 67
LABOR OPERATIONS

Name Oper. No.	Sides, Packing Box Seq. of Oper.	Name of Operation	Part A1 Std. Hrs. Per M	Std. Rate Per Hr.	Std. Cost Per M
1	1	Bring truck of lumber from dry kiln and place by cut-off saw. 0.1 hr. per load Std. Pcs. per load 1000	.100	$.60	$.06
2	2	Cut to length & place on conveyor	.300	.60	.18
3	3	Rip to width	.500	.60	.30
4	4	Place on conveyor leading to nailers	.50	.60	.30
			1.40	$.60	$.84

SUMMARY OF LABOR COST ON ASSEMBLY A

Part No.	Name	Qty. Per Box	Std. Hrs.	Std. Rate	Total Unit Cost Per M
A1	Sides	2	2.8	$.60	$ 1.68
A2	Ends	2	4.5	.60	2.70
A3	Bottom	1	3.5	.60	2.10
Final assembly (detail built up same as in above schedule)			119.3	.60	71.58
Total			130.1	$.60	$78.06

The most common way of approaching and doing time study is from the viewpoint of the time required to perform all operations in making a definite part, sub-assembly or assembly.

The other way is the time required to perform definite elemental operations, processes, etc. Once standard times are determined, recorded, charted, plotted, or worked up in formulae, a standard time per piece part can be determined mathematically.

The following examples will illustrate the difference. In the first method mentioned assume you have a time of .05 hours per piece part A100. Suppose you decide to make another part which is entirely new. Unless it is exactly the same as part A100 or very similar it is impossible to establish a time standard without taking a new time study when the part is in production.

In the other method from an analysis of the elemental operations that the piece part must go through and selection of the standard time from records on hand for the operations and elements necessary, a correct standard time can be calculated very quickly before the new part is put into production. To illustrate how this would reduce the time study required assume a hundred piece parts each going through a certain punch press operation. The punch press running time would be the same for each of the hundred pieces. To time study this the second method would require two time studies.

1. Set Up Time.
2. Running Time, varying with a definite unit of measure.

Once you have this you can establish the time standards on all the pieces that will ever be run through this operation.

The first method mentioned would require two time studies for each piece part or two hundred time studies.

Setting standard times by formula is being done successfully now. For details of how to do this and construct formulae, as well as details on how to make time studies see "Time and Motion Study," by Lowry, Maynard, and Stegemerten.[1]

One thing to bear in mind when establishing time standards is, that the basis must be fair. It must include all necessary time. Any good time study engineer today will establish a standard that is fair to both the company and the employees. A standard time for labor is not an unattainable standard. As long as the method of performing an operation remains the same, whether it is one year, ten years or a hundred years, the standard time to perform the operation should be the same. Labor rates may change, but the time element will never change. . . .

Regardless of the method, the basis of determining labor time standards must be fair to both the employees and the company. The goal set should aim at maximum efficiency, but it should be reasonable and attainable. When a labor time standard is correctly set, it should remain in use until changes occur in the method of performing the operation or until the quality or time of labor used is changed. The setting of such standards has no budgeting requirements.

Standards for Labor—Price (Labor Rates).—Unfortunately, a customary procedure in obtaining labor rates for use as standards has been either to select the rates paid during past periods for each class of labor or to set standards at a figure the management considered the rates should be. The standards obtained by either method are unreliable and inaccurate. Labor rates are prices determined in a competitive market in which the factors of supply and demand are usually active and are constantly changing in relationship to each other. If labor price standards are to be of any value to management as a guide to future operations and profits, they must adhere as closely as possible to the actual labor rates which will be in existence during the next period. In some industries, such as the clothing trades, wage rates are agreed upon for many months in advance by contracts between the unions and the management of the various companies. In cases where wage rates are relatively fixed, the contract wage rate or the agree-to piece-rates may be used as the standard for the period.

In many cases, however, wage rates are highly competitive and the labor market changes from month to month. In setting labor standards for this type of labor, a careful survey of the labor conditions within the company and in both local and national labor markets is necessary. The labor budget should show the labor requirements for each class of labor for the budget period. The conditions underlying each class of labor in

[1] LOWRY, MAYNARD, and STEGEMERTEN, "Time and Motion Study," McGraw-Hill Book Company, Inc., New York.

the local market should be analyzed, and the expected changes should be charted or at least considered. The influence of the conditions prevailing in the national labor market upon the intercompany relations and local labor conditions should be considered. The forecasted wage rates should be set as the standard for the budget period. The standard rates, once determined, should be used without change for the period of the budget; any difference, more or less than standard, is considered as a variance. Labor price standards are best considered as budget estimates subject to revision at the end of each budget period.

Standard wage rates are determined in a different manner when piece-rates and bonus or premium plans are in use. When piece-rates are the means of compensation employed in a department, workers are paid a set rate per piece regardless of the quantity of production. Therefore the labor cost per piece or operation is a uniform amount, and the piece-rate becomes the standard labor price. When bonus or premium plans are in use as a means of compensating workers, the problem arises as to whether or not the extra compensation should be considered in setting the standard wage rate. If it is decided to include this element in the standard, the amount to be added must be determined by a study of bonuses and premiums paid during past periods and an average amount per labor operation must be computed.

Standards for Overhead Expenses.—The preparation of standard rates for the allocation of overhead expenses to production is more complex than is the development of either material or labor standards. Two distinct problems are involved: the estimation of the overhead components, such as indirect labor, supplies, depreciation, power, taxes, and rent, and the determination of estimates of production which form the basis for setting standard overhead rates. The preparation of both estimates is dependent upon an adequate system of budgetary control, and the use of budgets becomes more essential in the development of overhead standards than of either material or labor standards.

Of the three elements of cost, in the development of the older types of cost systems, standardization of overhead has received the most attention. Virtually, standards are employed as overhead distribution rates in concerns using carefully designed job order cost systems. If departmentalization has not been followed as a basis for the accumulation of overhead, the total overhead expense for the concern is estimated in the form of an overhead budget; the production for the period is budgeted for direct labor hours, direct labor cost, or machine-hours; and the estimated overhead is divided by the estimated production, in terms of one of the three bases, to obtain a distribution rate which is used for the purpose of allocating overhead to production during the budget period. In departmentalized concerns the estimates of overhead are classified by

service and production departments, and the service department estimates are reallocated to the production departments; the production expected from each production department is estimated; and the estimated overhead for each department is divided by the estimated production of that department, expressed in terms of direct labor hours, direct labor cost, or machine-hours, to obtain an overhead distribution rate for each department.

Thus, whether a single overhead rate or departmental rates are established through the use of budgets, the general procedure for establishing standard overhead rates is the same as that employed in computing predetermined overhead distribution rates under the job order cost system. However, the purpose or goal differs in the case of standards. In determining the standard rate, the budget estimates are subjected to careful analysis and are revised so as to constitute what overhead costs and production *should be*, while, under the job order cost plan, estimates which represent expected conditions of expense and production are used. It should be emphasized that overhead expense standards may result from an analysis of budgets of overhead but that the overhead budgets may still be used by management for production planning and general financial control; the overhead standards for each expense may be determined and used for departmental control independent of the regular overhead budgets.

When enterprises are not departmentalized, the formula for the standard overhead rate is as follows:

$$\frac{\text{Standard overhead for budget period}}{\text{Standard direct labor hours (or some other base) for budget period}} = \text{standard rate per direct labor hour.}$$

When enterprises are departmentalized, the formula for the standard overhead rate for each production department is as follows:

$$\frac{\text{Standard overhead for Dept. A for budget period}}{\text{Standard direct labor hours (or some other base) Dept. A for budget period}} = \text{standard rate, Dept. A, per direct labor hour.}$$

The problems involved in deriving standard overhead distribution rates are as follows:

a. Determination of what standard rates should represent.
b. Selection of a normal period of time and computation of normal rates.
c. Computation of the standard overhead.
d. Estimation of the production which represents standard.

What Standard Rates Should Represent.—The proper estimation of overhead expenses in the development of standards is based upon overhead and production budgets. The standard overhead items should be

established after proper investigation and survey of the present and expected expenses for the budget period, and after consideration is given to the rate and amount of production for the period. It may be concluded that, for purposes of managerial control, it is logical to prepare the overhead estimates as standards in terms of the conditions to be expected during the period under consideration as shown in the manufacturing overhead budgets.

The other problem, the proper estimation of the amount and rate of production which forms the basis of setting overhead standard rates, may be formulated and solved after selecting one of the following possibilities:

a. The maximum theoretical capacity of the plant.

b. The maximum capacity of the plant, less allowances for normal idle time, vacations, and other ordinary operating interruptions.

c. Average or normal conditions of production, consideration being given to a past period, such as the last 5 years.

d. Estimated production, based on the sales expected for the budget period.

The fourth possible basis for the setting of the standard amount of production seems the most practical and useful. The present state of the market for the company products, the expected changes in market conditions of a seasonal nature or arising during periods of depression, expected changes in demand due to new styles or to the development of substitute products by competitors, and changing management policies should all be carefully considered in the forecasting of the expected volume of business at prevailing or expected sales prices for the budget period. The resulting estimates are usually reduced to such terms as direct labor hours, direct labor cost, machine-hours, or units to be produced, with the further classification by production departments where departmental rates are desired. The standards set for production should be used during the budget period, and actual performance should be controlled so as to be brought into agreement with the standards. The standards should be revised at the beginning of each budget period.

Normal Standard Overhead Rates.—It is generally recognized that it is unsound and inequitable to compute the standard overhead rate for a product in terms of the budgeted overhead expense or production for a single month, because the standard rate thus compiled is too high during months of inactivity and too low during periods of large production. Therefore a normal standard rate for the distribution of overhead to a product is computed by dividing the total standard overhead for a normal budget period, such as a year, by the total standard production, in terms of direct labor hours, machine-hours, or direct labor cost, for the same period of time. The normal standard overhead rates may be determined for the plant as a whole or by departments or operations, depending upon the degree of departmentalization which exists within the plant.

When a normal rate is used, variances between actual overhead and standard overhead may be attributed in part to either seasonal conditions of overhead or seasonal production. It is explained in the next chapter that variances caused by seasonal conditions which have been provided for in the preparation of the normal rates should be carried as deferred items from month to month until the end of the budget period, because they are offset by counteracting expense and production conditions during other months.

Preparation of Standard Overhead Estimates.—The numerator in the formula used to compute standard overhead rates, "the standard overhead," is computed by means of a careful analysis and revision of the budget estimates of overhead for the period. If the concern is not a departmentalized organization, the general budget of overhead expected to be incurred during the budget period is the beginning point for the analysis. If the concern is departmentalized into service and production departments, the budget items must be classified and apportioned by departments; the service department estimates are subsequently reapportioned among the production departments.

Expense estimates may be divided into the three major classes: fixed, semifixed, and variable expenses. Fixed expenses include those items which are not changed appreciably by increases or decreases in productive activity; semifixed expenses vary to some extent with changes in production; and variable expenses are composed of those items which vary directly in amount with changes in production. The expenses in the second and third classes can be controlled, within certain limits, by management.

Each of the estimates of fixed expenses should be carefully analyzed by executives to ascertain that they are correctly computed and are necessary to the operation of the enterprise. For example, the adequacy of the depreciation rates should be verified; the tax bills for past periods, the assessed valuation of the property, and the existing tax rates should be checked; the insurance and rental contracts should be inspected; and the executive payroll should be analyzed in order to determine whether all such expenses are fixed and cannot be decreased without impairing the operating efficiency of the plant. The estimated fixed expenses, as shown by the budget, constitute the standard cost for these particular items. Generally there is little or no variance between standard and actual costs of items in this group.

In determining standard costs for semifixed and variable items of overhead expense, the budget that contains the estimated overhead expenses for each service and production department should be analyzed in the light of the expected production for the budget period. Each expense should be discussed with the department head involved, and an

agreement should be reached as to the minimum amount that should be required without impairing the operating efficiency of the department. The standard amount set is what the item of expense *should be* rather than what it has been in the past or is aniticipated to be for the next period. When the standard for each item of expense, fixed and variable, has been agreed upon, the standard amounts by items of expense are shown for each department in a standard overhead cost sheet which is used for the purpose of comparing standard and actual expenses as the period progresses; the checkup is usually made monthly.

Standard Production.—The correct standard for production, the denominator of the formulas used in computing the standard overhead rates, is more difficult to determine than is the standard overhead expense. The standard production should represent the estimated production based on the expected sales for the budget period, reduced to such common bases of expense allocation as direct labor hours, direct labor cost, machine-hours, and units of production.

The starting point is the sales budget, which contains an estimate of the number of units of each type of product expected to be sold during the budget period. A production budget, based on the sales estimates, must be prepared to show the production expected of each department in order to comply with the sales requirements. The production budget should be supported by schedules showing the estimated number of direct labor hours, estimated direct labor cost, or estimated machine-hours for each department required to complete the number of units of products recorded in the production budget.

If the plant is operated at a highly efficient level, the setting of the standard production for each department is largely a matter of determining the number of direct labor hours, direct labor cost, or machine-hours which should be expended in completing the desired production. The decision is based upon information regarding productivity during past periods, and a forecast of what can be done during the budget period.

Flexible Budgets.—The normal production of many manufacturing enterprises can be forecasted for periods of from 6 months to 1 year with a reasonable degree of accuracy. Consequently it is sufficient to have a single standard overhead distribution rate per direct labor hour or a percentage of direct labor cost for concerns not departmentalized and a single rate for each production department in a departmentalized organization. There are some enterprises for which it is impossible to predict the volume of production for more than a few weeks or months in advance of actual scheduling of work. In such cases the determination of standard overhead distribution rates presents a problem, because a single rate for the factory or a rate for each department which will represent one of several volumes of production cannot be computed. It is pos-

sible to meet this difficulty by preparing a flexible budget which will show estimates of the overhead expenses required to operate the plant at various levels of productive activity. Estimates of production in terms of such a base as direct labor hours or direct labor cost can be prepared within certain limits, an upper limit representing the maximum capacity

STANDARD OVERHEAD EXPENSES, STANDARD PRODUCTION, AND STANDARD OVERHEAD EXPENSE RATES FOR VARIOUS VOLUMES OF PRODUCTIVE ACTIVITY

Normal production: 10,000 standard hours — Month: January

Standard overhead expense rate	$0.47	$0.44	$0.40	$0.38	$0.36
Standard direct labor hours	8,000	9,000	10,000	11,000	12,000
Percentage of normal production, per cent	80	90	100	110	120
Fixed expenses:					
Executive salaries	$ 600	$ 600	$ 600	$ 600	$ 600
Rent	200	200	200	200	200
Depreciation of machinery	300	300	300	300	300
Insurance	50	50	50	50	50
Taxes	75	75	75	75	75
Total fixed expenses	$1,225	$1,225	$1,225	$1,225	$1,225
Semifixed expenses:					
Supervisory salaries	$ 750	$ 800	$ 800	$ 800	$ 875
Clerical salaries	285	300	300	300	350
Light and heat	75	80	80	80	85
Building service	45	50	50	50	50
Total semifixed expenses	$1,155	$1,230	$1,230	$1,230	$1,360
Variable expenses:					
Indirect labor	$ 700	$ 780	$ 800	$ 900	$ 900
Factory supplies	200	220	225	235	235
Office supplies	70	75	75	80	80
Plant maintenance	140	145	150	160	160
Repairs	100	105	110	120	120
Spoiled and defective work	80	85	85	100	105
Power	90	95	100	130	135
Total variable expenses	$1,380	$1,505	$1,545	$1,725	$1,735
Total expenses	$3,760	$3,960	$4,000	$4,180	$4,320

Exhibit 68.

of plant operation and the lower limit the minimum capacity below which operations are not expected to fall. Between these two extremes one or more levels of possible production may be designated, one of which may be deemed normal. The estimation of the amount of each overhead item and of the total overhead expense which will be required for each volume of production is a managerial problem.

Exhibit 68 is a schedule of standard overhead expenses, standard direct labor hours, and standard overhead distribution rates for various volumes of production for a small factory which is not departmentalized. The schedule shows the computation of a standard overhead rate for each of the five levels of production. The standard rate for each volume of production is computed by dividing the total standard overhead expense by the standard direct labor hours for that volume of production. Thus the $0.40 an hour standard rate for 100 per cent of normal production is obtained by dividing the standard overhead expenses of $4,000 by the normal production of 10,000 hr. Each rate is computed in a like manner, with the result that the standard rates per hour tend to decrease with an increase in production and tend to increase as production decreases in volume. This condition is generally true because of the existence of fixed expenses which do not vary and of semifixed charges which vary only to a small degree with an increase or decrease in production volume.

When flexible budgets are prepared with standard rates adjusted to volume of production, it is possible to determine standard rates of the year's production for each month in advance and to use each month the standard overhead rate which most accurately typifies the conditions of production for the month.

Revision of Standards.—Accountants differ widely in their opinions concerning the revision of standards. One group contends that, if a standard is revised during an accounting period, the changing of the "yardstick" destroys the means of measuring efficiency and that, even if errors are disclosed, the revision of the standards should be delayed until the end of the accounting period. A second group insists that a standard should be changed immediately after it is found to be in error, since an incorrect standard may affect adversely the initiative and incentive of the workers and executives involved.

A middle ground is favored for practical reasons. No change in quantity standards for material need be made unless there is a change in the type of material, quality of material, or method of production; unless, of course, an error was made in setting the original standard. Two successive purchases of material may contain slightly different grades or quality, which may cause a slight variance in material consumption. It would be impractical to change the material quantity standard, because later purchases may be made of the material originally tested when the standard was determined. Similarly, slight changes are constantly being made in labor and in machine operations which may cause a small variance between standards and actual results.

In every factory, management and technicians are constantly striving to improve methods and to bring about technological changes. When

important changes in machine or labor operations or materials of different quality or type are used, standards should be changed immediately. Both price standards for material and labor rates should be revised when there are important changes in market prices for material and labor. Every standard cost system should be subjected to periodic review so that standards may be revised when they are incorrectly set or become outdated in terms of production methods. An alert cost department may be constantly adjusting and revising cost standards in order that standards will not be misleading to management. Changes may be made in specific standards without disrupting the entire standard cost system.

Questions

1. Are standards exclusively a product of this decade? Discuss various forms of standards that have been used before the advent of standard cost systems.

2. What defects in the older types of cost accounting have led to the development of standard costs?

3. Are standard cost accounting plans separate types of cost systems? Explain.

4. Define standard costs. At what level should standards be set? Explain your answer, indicating the differences between quantity, time, and price standards.

5. What advantages are attributed to the use of standard costs? Discuss each advantage briefly.

6. How should manufacturing departments and factory personnel be organized in preparation for the operation of a system of standard costs?

7. What are standard cost cards? What information do they contain? Of what importance is a file of standard cost cards to management?

8. How are standards for material quantities prepared? Should any allowance be made for waste or spoilage of materials? Are material quantity standards subject to frequent change?

9. What procedure should be followed in preparing material price standards? Of what importance are budgets in setting these standards? How frequently should material price standards be revised?

10. Describe the process employed in computing labor time standards.

11. How are labor price standards (labor rates) determined? What budgetary elements are involved?

12. Discuss the procedure involved in setting overhead expense standards. Give the formula for the determination of a standard departmental overhead distribution rate.

13. What factors determine the level at which standard overhead distribution rates should be set? What should standard rates represent?

14. Should standard overhead expense distribution rates be normal rates? Explain. Describe the process of preparing standard overhead and standard production estimates.

15. What are flexible budgets? How may standard overhead distribution rates be computed for various volumes of productive activity? How are such rates used in costing production from month to month?

16. Discuss the problem of revising standards.

CHAPTER XVII

ACCOUNTING FOR STANDARD COSTS

A variety of methods of accounting for standard costs are in use at the present time. The lack of uniformity of method is in part because standards are a recent managerial device and in part because standards are superimposed upon existing cost systems which have been adapted to the needs of the individual concern.

Standard Cost Accounting Procedure.—The following methods of accounting for standard costs may be considered the most representative of the various types in use:

I. Charge work in process accounts with actual costs and credit with standard costs, variances being derived at the end of each accounting period.

II. Charge work in process accounts with standard costs, credit with standard costs, and compute variances prior to entries in work in process accounts.

These accounting procedures are generally used in connection with process or operation cost methods in mass-production plants which fabricate uniform products according to standard specifications.

METHOD I: CHARGE WORK IN PROCESS WITH ACTUAL COSTS AND CREDIT WITH STANDARD COSTS

This method is favored because of its simplicity and the minimum day-to-day accounting which is required. It is limited as an aid to management because the effectiveness of standards cannot be tested until the end of each accounting period, when a comparison can be made between actual and standard costs and when variances can be computed.

The accounting procedure required for enterprises in which three work in process accounts are used is shown below in outline form, and graphically as Exhibit 69. The plan is illustrated in detail through the medium of a problem with an accompanying solution. An explanation of the salient features of the diagram and problem is given in sections which follow.

General Accounting Plan.—The general accounting program followed in the application of the plan may be outlined as follows:

a. The preparation of standards for material, labor, and overhead expense for each product in advance of the accounting period.

b. The use of standard costs in costing all work completed during the accounting period; the work in process accounts are credited and Finished Goods is debited at standard.

c. Transfer of the standard cost of goods sold from Finished Goods to Cost of Goods Sold.

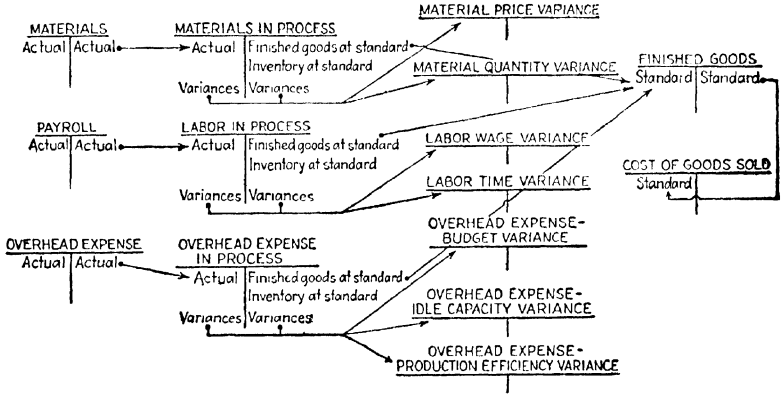
d. During the accounting period, the recording of actual material cost in a Materials account, actual labor costs in a Payroll account, and actual overhead expense items in an Overhead Expense account.

e. At the end of each accounting period, the transfer of actual cost of direct materials consumed, the total direct payroll cost, and actual overhead expenses to work in process accounts.

EXHIBIT 69

DIAGRAM OF STANDARD COST ACCOUNTING PROCEDURE WHEN WORK IN PROCESS ACCOUNTS FOR MATERIALS, LABOR, AND OVERHEAD ARE CHARGED FOR ACTUAL AND CREDITED FOR STANDARD COSTS

(Method I)



f. As a function of the closing process, the computation of the value of work remaining in process at standard cost and the transfer of the inventory value to a Work in Process Inventory account.

g. The computation of the variances representing the differences between standard and actual costs and the transfer of the variances to separate variance accounts. This transfer closes the work in process accounts.

h. The analysis and disposition of each variance account.

i. Transfer of work in process inventories from the Work in Process Inventory account to the original work in process accounts as opening inventory balances for the next accounting period.

j. Revision of standards which have been incorrectly computed.

Standard Cost Problem

The Glasco Manufacturing Co. produces a single standard product termed Glasco. The standard overhead expenses for January, according to the overhead budget, are $2,000; the standard production for the month is 4,000 direct labor hours, based on the production budget. The standard cost card for the product Glasco is as follows:

Standard Cost Card Product: Glasco	Jan. 1, 19__
Materials:	
20 pieces of x @ $0.40	$ 8
Labor:	
10 hr. @ $0.60	6
Overhead expense:	
10 hr. @ $0.50	5
Standard cost per unit	$19
Selling price per unit	$25

The following transactions occurred during the month of January:

1. Purchases according to purchase orders:

10,000 pieces of x @ $0.45	$4,500
Supplies	600
Total	$5,100

2. Materials and supplies consumed per requisitions at actual:

9,100 pieces of x @ $0.45	$4,095
Supplies	500
Total	$4,595

3. Labor cost per payrolls:

Direct labor, 4,300 hr. @ $0.62	$2,666
Salaries (indirect payroll)	700
Total	$3,366

4. Overhead per expense vouchers:

Rent	$ 200
Repairs	50
Power, light, and heat	175
Total	$ 425

5. Overhead expenses per monthly adjustments:

Depreciation of machinery and equipment	$ 100
Insurance expense	25
Taxes	50
Total	$ 175

6. Production completed during January:
   400 units.
7. Work in process inventory, Jan. 31:
   50 units; all material is consumed at beginning of production; production estimated to be one-half completed for direct labor and overhead expense.
8. Sales for January on account:
   350 units @ $25 ..... $8,750

Required:

Prepare journal entries to record the transactions for January; work in process accounts are to be charged for actual costs and credited for standard costs, variances being transferred to separate variance accounts.

Solution—Standard Cost Problem

JOURNAL ENTRIES

(1)

Materials	$5,100	
Vouchers Payable		$5,100

To record actual cost of direct materials and supplies purchased.

(2)

Materials in Process	$4,095	
Overhead Expense	500	
Materials		$4,595

To record materials and supplies consumed in production processes according to requisitions.

(3*a*)

Payrolls	$3,366	
Vouchers Payable		$3,366

To record vouchering of payrolls, both direct and indirect.

(3*b*)

Labor in Process	$2,666	
Overhead Expense	700	
Payrolls		$3,366

To distribute payrolls per payroll analysis; direct labor, $2,666; indirect labor, $700.

(4)

Overhead Expense	$ 425	
Vouchers Payable		$ 425

Vouchering of overhead expenses:
rent, $200; repairs, $50; power, light, and heat, $175.

(5*a*)

Overhead Expense	$ 175	
Reserve for Depreciation, Machinery, and Equipment		$ 100
Prepaid Insurance		25
Accrued Taxes Payable		50

Monthly adjustments for depreciation, insurance, and taxes.

(5*b*)

Overhead Expense in Process	$1,800	
Overhead Expense		$1,800

To transfer total actual overhead expenses to Overhead Expense in Process account.

(6)

Finished Goods	$7,600	
Materials in Process		$3,200
Labor in Process		2,400
Overhead Expense in Process		2,000

To record standard cost of units completed during the month.

Elements of cost	Units	Standard cost per unit	Amount of standard
Material	400	$ 8	$3,200
Labor	400	6	2,400
Overhead expense	400	5	2,000
Total		$19	$7,600

(7)

Work in Process Inventory	$ 675	
Materials in Process		$ 400
Labor in Process		150
Overhead Expense in Process		125

To transfer work in process inventory at standard from work in process accounts to the Work in Process Inventory account; full value is given material while labor and overhead are considered ½ finished.

Elements of cost	Units	Standard cost per unit	Amount of standard
Material	50	$ 8	$400
Labor	25	6	150
Overhead expense	25	5	125
		$19	$675

(8a)

Accounts Receivable	$8,750	
Sales		$8,750

To record sales for January: 350 units @ $25 = $8,750

(8b)

Cost of Goods Sold	$6,650	
Finished Goods		$6,650

To record the standard cost of units sold during January: 350 units @ $19.00 = $6,650.

(9)

Material Price Variance	$ 455	
Materials in Process		$ 455

To record variance from standard price for actual quantity of material consumed.

Actual pieces	Actual price	Standard price	Price variance	Amount of variance
9,100	$0.45	$0.40	$0.05	$455

(10)

Material Quantity Variance	$ 40	
Materials in Process		$ 40

To record cost of excess materials used, priced at standard.

	Pieces
Actual quantity used per requisition	9,100
Standard quantity (450 units × 20 pieces)	9,000
Excess of quantity used over standard	100

Cost of excess quantity: 100 × $0.40 (standard price) = $40.

(11)

Labor Wage Variance	$ 86	
Labor in Process		$ 86

To record the variance from standard labor price.

Actual hours	Actual wage rate	Standard wage rate	Wage rate variance	Amount of variance
4,300	$0.62	$0.60	$0.02	$86

(12)

Labor Time Variance ..... $ 30
  Labor in Process ..... $ 30
To record variance due to excess of actual over standard labor time.

	Hours
Actual labor hours per payroll	4,300
10 standard hours per unit × 425 units (400 units completed + 50 units ½ completed)	4,250
Excess of actual labor hours over standard	50

50 hr. × $0.60 (standard rate) = $30.

(13)

Overhead Expense in Process ..... $ 200
  Overhead Expense—Budget Variance ..... $ 200
To record saving in actual overhead expense compared with standard overhead expense.

Standard overhead expense per budget	$2,000
Actual overhead expense	1,800
Amount saved over standard	$ 200

(14)

Overhead Expense in Process ..... $ 150
  Overhead Expense—Over Capacity Variance ..... $ 150
To record the variance in overhead expense due to actual production (direct labor hours) being in excess of standard production.

	Hours
Actual direct labor hours per payrolls	4,300
Standard direct labor hours per budget	4,000
Excess of actual hours over standard	300

300 hr. × $0.50 (standard overhead expense rate) = $150

(15)

Overhead Expense—Production Efficiency Variance ..... $ 25
  Overhead Expense in Process ..... $ 25
To record the loss due to excess hours of overhead expense, because labor hours were used in excess of standard labor hours for production of period (see entry 12).

	Hours
Actual direct labor hours per payroll	4,300
Standard direct labor hours (425 units × 10 hr.)	4,250
Excess of actual direct labor hours over standard	50

50 hr. × $0.50 (standard overhead expense rate) = $25

(16)

Materials in Process	$ 400	
Labor in Process	150	
Overhead Expense in Process	125	
Work in Process Inventory		$ 675

To transfer balances of work in process from the Work in Process Inventory account to the original work in process accounts so as to show opening balances on Feb. 1.

Standards as a Means of Costing Completed Production.—After standards are determined for materials, labor, and overhead, the standards are used for costing purposes during the accounting period. As work is completed and transferred from production processes to the finished goods stockroom, the standard cost card for each product is used as the basis for determining the cost of the goods completed; the standard cost is multiplied by the number of units shown as finished in the daily or weekly production report. The general ledger entry required is a debit to Finished Goods and credits to Materials in Process, Labor in Process, and Overhead Expense in Process for the standard cost of completed production.

The Finished Goods account and the subsidiary finished goods ledger show the standard cost of products in stock. As units are sold, they are issued from the finished goods stockroom at standard cost; a summary entry is made periodically debiting Cost of Goods Sold and crediting Finished Goods at standard cost.

Accounting for Actual Costs.—During the accounting period actual costs are recorded in the three major controlling accounts, Materials, Payroll, and Overhead Expense. The cost of materials purchased is entered in the subsidiary stock ledger in detail and is charged in total to the Materials account in the general ledger; the credit is to Vouchers Payable and the medium of entry is the voucher register. Payrolls are vouchered weekly and are entered as a debit to Payroll and as a credit to Vouchers Payable. Expenses such as repairs, light and power, telephone and telegraph, and rent are vouchered and charged to the Overhead Expense account. At the end of the accounting period adjusting entries are made for depreciation, taxes accrued, and insurance expired; the Overhead Expense account is debited and Reserve for Depreciation, Accrued Taxes Payable, and Prepaid Insurance are credited. The total amount of supplies and indirect materials consumed is transferred from Materials to Overhead Expense, and the indirect labor for the period is charged to the Overhead Expense account and credited to the Payroll account.

At the end of each accounting period the actual amount of materials consumed is charged to the Materials in Process account and is credited to the Materials account; the total amount of the direct labor payroll is

debited to the Labor in Process account and is credited to the Payroll account; and the total overhead expense for the period is charged to the Overhead Expense in Process account and is credited to the Overhead Expense account. Thus the three work in process accounts show debits representing the total actual cost of production for the period and credits exhibiting the total standard cost of units completed and transferred to finished stock.

Computation of the Value of Work in Process Inventories.—If there are no units of production remaining in process at the end of the accounting period, the balances of the work in process accounts represent variances between standard and actual costs. If an inventory of work in process exists, it is necessary to evaluate the inventory before variances between standard and actual costs are computed. The methods employed in the evaluation of inventories are identical with the principles explained in dealing with process costs, with the exception that standard costs are used as a basis for costing instead of actual costs. Standard costs, as shown in standard cost cards, must be used in order to cost all production on the same basis. Production completed during the period is costed at standard, and goods remaining unfinished are evaluated on the same basis.

In order to determine the stage of completion of units remaining in process, it is necessary to examine each batch and to estimate the progress made toward its completion in terms of proportion or percentage. Thus it may be estimated that the 10 units remaining in process are one-half completed. If the standard cost per unit of material is \$1, of labor \$3, and of overhead expense \$1.50, the 10 units represent 5 units in terms of completed products, and the value of the work in process inventory at standard cost is \$27.50. Assuming the same facts, if it is found that all the material is used at the beginning of the production process, the inventory is considered to represent 10 units in terms of completed products for materials and 5 units in terms of completed production for labor and overhead expense. Thus the inventory value is \$10 for material (10 units × \$1), \$15 for labor (5 units × \$3), and \$7.50 for overhead (5 units × \$1.50) or a total of \$32.50.

The inventory of work in process at standard may be transferred temporarily from the work in process accounts to a Work in Process Inventory account at the end of each accounting period, or the amount of each inventory may be brought down as balances in the work in process accounts after the variances in each account have been transferred to separate variance accounts. If the first plan is followed, the balances are restored to work in process accounts as opening balances for the next period and the Work in Process Inventory account is credited. In

either case the work in process inventory appears in the balance sheet for the period as a current asset.

Computation of Variances.—After work in process inventories have been determined, the balance remaining in each work in process account is indicative of the differences between standard and actual costs. For proper managerial control over costs, it is essential that each balance be carefully dissected into its component parts and that separate variance accounts be created to isolate and emphasize the causes underlying each variance.

The most common causes of variances may be classified as follows: material price variance, material quantity variance, labor wage variance, labor time variance, overhead expense—budget variance, overhead expense—idle capacity or overcapacity variance, and overhead expense—production efficiency variance. The derivation of each variance requires an explanation.

Material Price Variance.—Material price variance represents the excess cost or the saving resulting from the purchase of direct materials consumed in production during the period at prices above or below the standard prices set for materials. If a loss is experienced, the Material Price Variance account is debited and the Materials in Process account is credited; if a saving results, the Materials in Process account is debited and the Material Price Variance is credited for the amount of the gain.

The method used in computing the variance is as follows: obtain from material requisitions or a materials summary sheet the total quantity of direct materials used; ascertain the actual cost of the materials from the stockroom records by the first-in, first-out method, the average cost method or the last-in, first-out method; secure the standard cost for each class of material from standard cost cards; multiply the actual quantity of materials consumed by the actual cost per unit; multiply the actual quantity of materials by the standard cost per unit; subtract the total standard cost of materials from the total actual cost, or vice versa; and the resultant is the material price variance.

In the illustrated problem the actual pieces of material used total 9,100; the actual price per piece is $0.45, while the standard price is $0.40; therefore the amount debited to the Material Price Variance account is $455.

Material Quantity Variance.—The material quantity variance is the indicator of the efficiency with which materials were utilized in production processes during the accounting period. A debit balance in the account shows the total cost of materials used was in excess of standard requirements; a credit balance indicates the saving over the standard cost in the use of materials. The Material Quantity Variance account is debited and Materials in Process is credited for the cost of materials wasted over standard requirements. Materials in Process is debited and the Material

Quantity Variance account is credited for the cost of materials saved over standard.

The basis for the computation of the material quantity variance is the record of materials consumed during the period. In some plants the material requisitions showing the actual quantities used are the source of the information, but in other concerns daily or weekly production records exhibit the quantities of materials consumed. The actual quantities of each class of material used are compared with the standard requirements as shown in the standard cost cards, and the quantities wasted or saved are multiplied by the standard price per quantity to obtain the net loss or gain through the use of direct materials.

In the illustrated problem the actual quantities of materials per requisition are 9,100 pieces while the standard requirements are 9,000 pieces (450 units × 20 pieces), which indicates that 100 pieces were used in excess of standard. This quantity is costed at the standard material price of $0.40 a piece according to the standard cost card, and the Material Quantity Variance account is debited for $40.

Labor Wage Variance.—The labor wage variance reflects the difference in the existing wage scale and the wage rates set as standards. If the rate of wages paid is in excess of the standard wage rate, the Labor Wage Variance account will receive a debit and the Labor in Process account will be credited at the end of each accounting period. If the actual wage rates are below the standard rates, a credit balance in the Labor Wage Variance account will reflect this condition and the Labor in Process account will be debited at the end of the period.

A comparison between the actual wages paid as shown in payroll sheets and standard wage rates as recorded in standard cost cards is the basis for the computation of the labor wage variance. The actual labor hours are multiplied by the actual wage rate for each class of direct labor; the actual labor hours are multiplied by the standard wage rate for each class of direct labor; and the difference between the two constitutes the labor price variance.

In the problem the actual direct labor hours are 4,300; the actual wage rate is $0.62 per hour; the standard wage rate is $0.60 per hour; and the resulting labor wage variance, representing a loss, is $86. The variance is shown as a debit balance in the Labor Wage Variance account.

Labor Time Variance.—The labor time variance is the barometer of the efficiency with which direct labor has been applied to the production of the period. A debit balance in the Labor Time Variance account indicates that the enterprise has experienced a loss because direct labor hours in excess of standard have been expended, while a credit balance shows that a saving has resulted because fewer direct labor hours were required than standard performance. When the Labor Time Variance account is debited, a corresponding amount is credited to the Labor in

Process account; a credit to the Labor Time Variance account requires an equal amount as a debit in the Labor in Process account.

The labor time variance is computed by comparing the actual direct labor hours, per payrolls, with the standard direct labor hours and multiplying the difference, which represents the excess hours used or hours saved as compared with standard requirements, by the standard wage rate for each class of labor. The standard direct labor hours are computed by multiplying the actual units of production for the period by the standard hours per unit as exhibited in the standard cost cards.

In the problem the actual direct labor hours per payroll total 4,300; the standard hours are 4,250 (425 units × 10 hr. per unit); the excess of actual hours over standard is 50 hr.; and the 50 hr. multiplied by the standard rate of $0.60 per hour equals $30, the labor time variance.

Overhead Expense—Budget Variance.—The three remaining variances result from the computation of the standard overhead rate by the formula:

$$\frac{\text{Standard overhead for budget period}}{\text{Standard direct labor hours (or direct labor cost) for budget period}} = \text{standard rate per direct labor hour.}$$

The overhead expense—budget variance is related directly to the numerator of the formula, but the overhead expense—idle capacity variance and the overhead expense—production efficiency variance are derivatives of the denominator, the standard direct labor hours.

The overhead expense—budget variance indicates how closely management had adhered to the standard budget for overhead expense for the period. If the variance account has a debit balance, it is indicative that actual overhead expenses have exceeded the standard budget of overhead for the period; a credit balance shows that a saving in actual expenses, compared with the budget, has been realized. The comparison of actual overhead expenses for the period with standard overhead expenses per budget should be made in detail, item by item. The variance for each expense, summarized as a single amount in the Overhead Expense—Budget Variance account, should be analyzed carefully, and the causes for its existence should be determined. The Overhead Expense in Process account is credited when the variance account is debited and is debited when the latter is credited. The amount of the overhead expense—budget variance is computed by comparing the actual overhead expenses for the period with the standard overhead expenses per budget.

In the problem the standard overhead expenses per budget were $2,000; the actual overhead expenses were $1,800; and the amount saved over standard was $200.

Overhead Expense—Idle Capacity Variance.—The account title may be changed to Overhead Expense—Overcapacity Variance when the plant is operated for a greater number of direct labor hours than provided for in the standard production budget. The Overhead Expense—Idle Capacity Variance account is used to denote the under- or overabsorbed overhead expenses for the period. A debit balance in the account indicates that a smaller number of direct labor hours representing production were expended during the period than was provided for in setting standard production in terms of direct labor hours and in computing the standard overhead rate. A variance is created because the standard overhead rate was not applied to enough hours of production to absorb all the overhead expense provided for in the budget. A credit balance in the Overhead Expense—Overcapacity Variance account signifies that a greater number of direct labor hours of production have been expended than was provided for in the standard production budget for the period. Overhead expense has been overabsorbed through the application of the standard rate to more direct labor hours than were anticipated. When the variance account is debited or credited, a corresponding credit or debit is made in the Overhead Expense in Process account.

The overhead expense—idle capacity variance is computed by comparing the standard direct labor hours per the production budget with the actual direct labor hours per payrolls for the period and by multiplying the number of excess or deficiency hours by the standard overhead expense rate. If the actual direct labor hours are less than the standard hours, an idle time factor results and the multiplication of the hours of idle time by the standard overhead rate per hour equals the total unabsorbed overhead expense, which is a loss to the enterprise.

In the problem there was 4,000 hr. set as the standard direct labor hours for the period, but the actual direct labor hours total 4,300. The 300 direct labor hours in excess of standard is multiplied by the standard overhead rate of $0.50 an hour to equal $150, the amount of the Overhead Expense—Overcapacity Variance account credit balance.

Overhead Expense—Production Efficiency Variance.—This variance is a barometer by which management may be informed of the overhead cost of excess direct labor hours applied to the period's production or the saving in overhead expense resulting from the completion of the period's production in less than the standard direct labor hours. A debit balance in the Overhead Expense—Production Efficiency Variance indicates that, for the production for the period, there were actual direct labor hours employed in excess of the standard direct labor hours required for the work.

If the standard direct labor hours required for a job total 20 hr. and the actual hours incurred are 22, there has been a dual loss to the enter-

prise. Two hours in addition to the standard were required to complete the job. The two hours costed at the standard wage rate per hour, which may be assumed to be $0.60, will reflect a loss of $1.20 which will appear as a debit balance in the Labor Time Variance account, discussed in a previous section. A second form of loss was experienced in the form of additional overhead expense because, for each extra direct labor hour in excess of standard requirements, plant facilities, including such overhead items as depreciation, supervision, power, light, rent, supplies, indirect labor, and repairs, were utilized. Overhead expense is incurred largely on the basis of time, and each hour of plant use is just as important an overhead cost factor as labor is a cost element.

In computing the overhead expense—production efficiency variance, it is necessary to follow the procedure used in connection with the labor time variance and to compare the actual direct labor hours per payroll with the standard direct labor hours for the period's production; the difference represents the excess or saving of direct labor hours as compared with standard. The resultant number of hours are multiplied by the standard overhead rate for the period to obtain the loss or gain, which is shown by a debit or credit in the Overhead Expense—Production Efficiency Variance account.

In the problem the actual direct labor hours per payroll total 4,300; the standard direct labor hours are 4,250 (425 units × 10 hr. per unit); the 50 actual direct labor hours in excess of standard requirements are multiplied by the standard overhead rate of $0.50 an hour; the $25 thus obtained is the debit balance of the Overhead Expense—Production Efficiency Variance account.

Disposition of Variances.—There is no uniformity of opinion among accountants as to the proper disposition of variances resulting from the use of standard costs as general ledger accounting data. One group of writers recommends that debit variances of all types should be transferred directly to Profit and Loss at the end of each month or quarter. They favor this treatment on the ground that all forms of variances represent conditions of waste, inefficiency, below-standard performance, idle time, and changes in business fortune, all of which are not correctly included in manufacturing costs. This policy results in the valuation of work in process inventories and finished goods inventory at standard cost, which is deemed to be a conservative and good business policy because inventories have been depleted of all unnecessary costs resulting from off-standard operations. Furthermore, the presentation of variances as a separate group of items in the profit and loss statement indicates to management the reduction in profits due solely to off-standard plant performance.

A second group of writers advocates that all types of variances, with the exception of material price variances, should be transferred to the

Profit and Loss account. In the case of material price variances it is recommended that the debit balance be prorated over inventory of materials in process, finished goods inventory, and cost of goods sold, so that price variances will be included in inventory valuations to be shown in the balance sheet and in the cost of goods sold, which is included in the profit and loss statement. The argument is advanced that price variances between standard prices and actual prices result largely from market and business conditions outside the control of the individual business enterprise and that, therefore, such variances are a legitimate addition to inventory values and to cost of goods sold.

Although the methods just explained are easy to apply and may be used for practical purposes, the variances are not disposed of in accordance with the best accounting practice. Each variance should be carefully analyzed, and the causes for its incurrence should be ascertained since the proper disposition of each variance depends upon the underlying reasons for its existence.

Disposal of Variances Attributed to Incorrect Standards.—Variances of all types which arise from incorrect standards should be adjusted proportionally to inventories and to cost of goods sold. If important errors are discovered in existing quantity or price standards, it is generally considered proper to adjust them immediately so that incorrect standards will not continue to be used in measuring operating efficiency. Since products processed during the period have been improperly costed, the proper remedy is to apportion the variances arising from incorrect standards to work in process inventories, finished goods inventories, and cost of goods sold in proportion to the period's production represented by each stage.

Disposal of Material Price Variance.—Material price variances may be due to inefficiency in purchasing, but generally they result from changes in market prices which are beyond the control of the executives of an individual concern and consequently are a legitimate addition to or a subtraction from inventory values and the cost of goods sold. A method of disposing of a debit balance in the account is to apportion it to work in process inventory, to finished goods inventory, and to cost of goods sold in proportion to the material value or material quantity of the period's production remaining in each stage. If this plan is followed, inventories of work in process and of finished goods will be valued at actual material price and standard material quantity.

If the Material Price Variance has a credit balance, it indicates a saving in purchase price compared with the standard price of material. It may be disposed of by deducting proportional amounts from work in process inventories, finished goods inventory, and cost of goods sold.

If an analysis of the material price variance proves that a portion or all the balance is the result of inefficiency in purchasing or if a saving has resulted from efficient purchasing, the loss or gain should be transferred directly to Profit and Loss. An exception may be made in case a sizable amount of the purchases during the period remain in inventories. In this case a portion of the variance should be treated as a deferred item pending transfer to the period's profit and loss account in which purchases of the present period are sold as finished goods.

Disposal of Material Quantity Variance.—A debit balance in the Material Quantity Variance account represents the cost of materials used in excess of standard requirements, usually accounted for by waste, spoiled work, and general inefficiency in the handling and consumption of materials. Since one purpose of standards is to remove such forms of inefficiency from production costs, a debit balance in the material quantity variance account should be transferred directly to Profit and Loss. A credit balance in the variance account represents a saving over standard in the use of materials, and the saving should be recognized by transferring the amount directly to Profit and Loss.

An exception can be made in cases where a small portion of the goods manufactured during the period has been sold and the major portion remains in inventories to be sold during subsequent periods. In this case variance should be treated as a Profit and Loss element, but only a portion of it should be transferred to the Profit and Loss for the present period; the remainder should be held in suspense as a deferred charge to be transferred to the profit and loss accounts of later periods. Otherwise losses and inefficiencies in the use of material are charged against the sales of products produced in other periods which were not involved in the inefficient production.

Disposal of Labor Wage Variance.—The case of a labor wage variance parallels that of a material price variance. A debit balance indicates that actual wage rates exceed standard rates. While the situation might possibly be attributed in part to the inefficient employment of workers by the personnel department, it is more likely that the increase in wage rates is due to conditions in the labor market which are beyond the control of the factory management. Since a higher wage rate than standard has existed during the period, labor put into production has not been properly costed. Therefore a debit balance in the Labor Wage Variance account should be apportioned to work in process inventory, finished goods inventory, and cost of goods sold according to the labor value or labor quantity of production remaining in each state of completion or sale at the end of the period.

A credit balance in the Labor Wage Variance account indicates that existent wage rates during the period have been less than the standard

rates. The amount should be used to reduce proportionally the balances in the work in process inventories, finished goods inventory, and cost of goods sold accounts.

Disposal of Labor Time Variance.—The existence of a debit balance in the Labor Time Variance account at the end of an accounting period shows that standard performance has not been attained in the use of labor and that the variance is the result of inefficient application of labor to production; hence the account should be transferred directly to the Profit and Loss account.

As in the case of material quantity variance, if production for the period remains in part in inventories and in part is represented by cost of goods sold, a proportional amount of the variance should be transferred to the Profit and Loss account of the present period, but the remainder should be held in suspense as a deferred charge to operations pending transfer to the Profit and Loss accounts of later periods when the production is sold.

A credit balance in the Labor Time Variance account represents a gain in efficiency in the use of labor under the standard. It should be transferred directly to Profit and Loss if the production for the period has been sold, or a portion of the variance may be carried as a deferred credit pending adjustment to subsequent periods' Profit and Loss.

Disposal of Overhead Expense—Budget Variance.—If the account has a debit balance, actual overhead expenses for the period have exceeded standard overhead expenses. The overhead expense—budget variance may be due either to seasonal conditions of overhead expense or to the incurrence of expenses in excess of standard requirements, or to both causes.

If the normal overhead expense rate is determined for a year consisting of 12 separate accounting periods, the standard overhead expense for the year is derived by adding together the 12 monthly estimates of overhead expense. At the end of any single month actual overhead expenses may exceed the standard amount for that month, but the excess will be offset by counteracting differences during other months of the normal period. If an analysis of the variance discloses that the debit balance arises from seasonal conditions of overhead expense, the variance should be treated as a deferred charge because it will be adjusted as a result of offsetting conditions in subsequent periods.

If the overhead expense—budget variance is due to expense being incurred in excess of the standard budget requirements, a form of business inefficiency has resulted. The amount of the variance due to this cause should be taken directly to Profit and Loss; the exception, as in the case of material quantity variance and labor time variance, occurs when a

portion should be deferred because substantial quantities of the period's production remain in inventories.

Both of the above situations and methods of disposal may be reversed when the Overhead Expense—Budget Variance account has a credit balance at the end of a month or quarter.

Disposal of Overhead Expense—Idle Capacity Variance.—This variance is involved in the analysis of standard production, the denominator of the formula used to compute the standard overhead rate. As in the case of the overhead expense—budget variance, the overhead expense—idle capacity variance may result from seasonal conditions or from off-standard conditions of production due to an inadequate amount of work supplied by the sales or administrative departments.

If the analysis of the variance indicates that the standard overhead rate is a normal one and that the existing seasonal conditions will be offset by productive activity in other periods, the variance should be treated as a deferred item until it is liquidated in subsequent periods by counteracting conditions.

If the variance arises because of a lack of orders scheduled for production, it reflects inefficiency on the part of the sales department or administrative division and should be treated as a direct charge to Profit and Loss. However, in this case also, a portion may be carried as a deferred charge, awaiting transfer to Profit and Loss accounts of other periods if a substantial amount of the production for the period remains in inventories.

A credit balance in the variance account, which will be termed Overhead Expense—Overcapacity Variance, indicates that the plant has been operated in excess of standard production and may be disposed of by reversing the procedure followed in connection with a debit balance.

Disposal of Overhead Expense—Production Efficiency Variance.—The overhead expense—production efficiency variance reflects the additional overhead elements required due to an excess of actual labor time over standard labor time being employed in completing production during the period. It is an indicator of plant inefficiency and should be disposed of by means of a transfer to Profit and Loss. As explained in regard to other types of quantity and time variances representing goods remaining in inventories, it may be necessary to hold a portion of the balance in suspense by means of a deferred account and to transfer it to Profit and Loss accounts of other accounting periods.

A credit balance indicates a saving in overhead expense and may be disposed of by reversing the procedure followed in connection with a debit balance.

Other Standard Cost Accounting Procedures.—There are other methods of accounting for standard costs by which work in process

accounts are charged for actual costs of production and are credited for the standard cost of work completed and transferred to Finished Goods. The more important plans may be briefly summarized as follows:

a. A Materials in Process account, a Labor in Process account, and an Overhead Expense in Process account may be used for each production department to record actual costs as debits and standard costs as credits.

b. A work in process account may be used for each product or each line of products to summarize the actual costs of each product or line of products as debits and the standard cost of production for each product or line of products as credits.

c. A Materials in Process account, a Labor in Process account, and an Overhead Expense in Process account can be used for each product or line of products.

When there are many production departments or products, the general ledger may become too congested if separate work in process accounts are maintained for each production department or product, and variance accounts for each department or product are used. It may be advantageous to subjugate detailed information regarding work in process and variances to subsidiary records and to exhibit the data on analysis sheets. For example, if there are 20 production departments, a controlling account termed Production Departments may be used to show the total actual production costs as a debit and the total standard cost of production completed during the period as a credit. A columnar analysis sheet or a separate subsidiary ledger account may be used to show the actual and standard costs for each production department. A single variance account of each type may be maintained in the general ledger to summarize the total variances by type, while a columnar analysis sheet may be used as a subsidiary record to record the variances of each type for each production department.

METHOD II: CHARGE WORK IN PROCESS ACCOUNTS WITH STANDARD COSTS, CREDIT WITH STANDARD COSTS, AND COMPUTE VARIANCES PRIOR TO ENTRIES IN WORK IN PROCESS ACCOUNTS

This accounting procedure requires a greater amount of day-to-day accounting and cost analysis than does Method I, but the additional cost of clerical help should be more than compensated for in the form of daily control by management over plant operations. Exhibit 70 presents graphically a standard cost accounting procedure when work in process accounts are charged at standard and credited at standard and when material and labor variances are computed prior to work in process entries. The accounting treatment and the derivation of variances are discussed for materials, labor, and overhead successively.

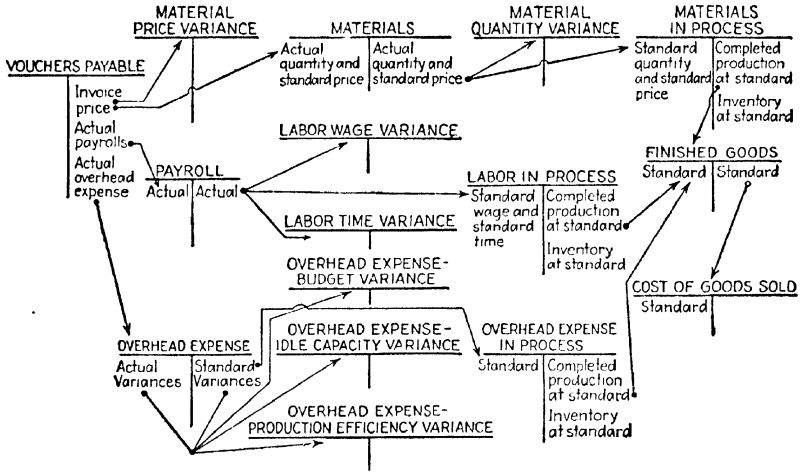
Accounting for Materials.—There are two methods of accounting for materials when the Materials in Process account is to be charged at standard costs and material variances are to be computed prior to entries being made to the Materials in Process account.

One plan, illustrated in Exhibit 70, reflects the valuation of material inventories at standard costs. Material price variances are recognized and charged to a Material Price Variance account at the time purchase invoices are vouchered and charged to the Materials account at actual quantities and standard price. The Material Quantity Variance account

EXHIBIT 70

DIAGRAM OF STANDARD COST ACCOUNTING PROCEDURE WHEN WORK IN PROCESS ACCOUNTS ARE CHARGED AT STANDARD AND CREDITED AT STANDARD AND MATERIAL AND LABOR VARIANCES ARE COMPUTED PRIOR TO ENTRIES IN WORK IN PROCESS

(Method II)



is inserted between the Materials account and the Materials in Process account for the purpose of recording variances between actual quantities and standard quantities of material priced at standard costs.

For example, if an invoice is received for the purchase of 100 units of material X at 10 cents a unit or a total cost of $10, and the standard price of material X is 9 cents a unit, the following entry in the voucher register is required:

General ledger:		
Materials	$9	
Material Price Variance	1	
Vouchers Payable		$10
Subsidiary ledger:		

Entry in received section of stock ledger account of 100 units of material X at actual quantity, standard price of 9¢ per unit.

In this way executive attention is focused daily on variances between standard and actual prices paid for raw materials and supplies. If price differences become acute, it may be necessary to revise the selling prices of finished products because of the adverse effect on profits.

Other important advantages which accrue when inventories of materials are priced at standard include the simplification of stores accounting and the saving of clerical time and labor in pricing and extending material requisitions. Standard material prices are inserted in inventory records in advance of the accounting period, and the pricings need not be changed unless standard prices are revised. Raw material inventories may be easily priced and may be shown in the periodic balance sheet at actual quantities and standard prices.

Daily or weekly, material requisitions priced at standard and representing actual quantities of direct materials consumed in production processes are sorted by jobs and by production departments. The standard material quantities required for production are ascertained and the material quantity variances, multiplied by the standard price of each class of material, are debited or credited to the Material Quantity Variance account; the Materials in Process account is debited for the standard quantity and standard price of material consumed; and the Materials account in the general ledger and the individual stock ledger accounts in the subsidiary ledger are credited for the actual quantity and the standard price of the material used.

As an illustration, if material requisition 1098 shows that 52 units of material X were required to complete a job for which the standard material requirements were 50 units of material X and the standard price per unit is 9 cents, the following journal entries are necessary:

General ledger:		
Materials in Process	$4.50	
Material Quantity Variance	0 18	
Materials		$4.68
Subsidiary ledger:		
Entry in issued section of stock ledger account for Material X of 52 units at 9¢, the standard price per unit.		

A second method of accounting for materials differs from the plan just explained in that the Materials account in the general ledger and the stock ledger accounts are debited and credited for the actual quantity and the actual price of materials and supplies. The cost of materials purchased per invoices is charged to the Materials account and is credited to Vouchers Payable; individual items are recorded in the Received section of stock ledger accounts supporting the Materials account. Material requisitions are prepared to show both the actual quantity and price and the standard quantity and price of materials used for production. Materials requisitioned from stockrooms are credited to the Materials account in the general ledger and are shown in the Issued section of individual stock ledger accounts at actual quantities and actual cost. Material price variances and material quantity variances are computed and debited

or credited to the Material Price Variance account and the Material Quantity Variance account, both of which are used as "buffer" accounts between the Materials and Materials in Process accounts to absorb differences between actual and standard material costs. The Materials in Process account is debited for the standard quantity and standard price of materials used in production processes.

For example, if an invoice is received for the purchase of 100 units of material X at 10 cents a unit or a total cost of $10, the following voucher register entry is required.

General ledger:

Materials	$10	
Vouchers Payable		$10

Subsidiary ledger:

Entry in the Received section of stock ledger account for material X of 100 units actual quantity; actual cost 10¢ per unit.

If material requisition 1098 shows that 52 units of material X were required to complete a job compared with the standard requirements of 50 units and the standard price per unit is 9 cents compared with an actual cost of 10 cents, the entries required to record the transaction are as follows:

General ledger:

Materials in Process	$4.50	
Material Price Variance	0.52	
Material Quantity Variance	0.18	
Materials		$5.20

Subsidiary ledger:

Entry in Issued section of stock ledger account for material X of 52 units at 10¢ per unit, the actual price; entry of $4.50, representing the standard quantity and standard price, in production order, if such orders are used.

Regardless of which of the two methods of accounting for materials is employed, the Materials in Process account is charged for the standard cost of materials used in production. As work is completed, the Materials in Process account is credited and the Finished Goods account is debited for the standard cost of materials applied to finished units. As units are sold, the Cost of Goods Sold account is debited and Finished Goods is credited at standard cost.

Accounting for Labor.—The plan of accounting for direct labor cost is to charge the Labor in Process account for the standard cost of direct labor applied to production, to credit the Payroll account for the actual labor cost, and to record variances between standard and actual costs in a Labor Wage Variance account and a Labor Time Variance account.

The method of recording daily labor costs varies with the individual enterprise. A common practice is to issue a time ticket for each workman

or each job showing the standard time requirement for tasks assigned. Each workman has before him, as an incentive to efficient work, the standard time requirements with which the actual time consumed is compared at the completion of the work. In many concerns a bonus is paid workmen who equal or surpass standard. When jobs are completed, notations of the standard wage rates and of actual time and actual wage rates are made in time tickets. Time tickets are sorted by production departments and jobs daily or weekly, and payrolls are prepared containing the actual time and wages of workers. Columns showing standard wage rates, total standard time, and variances between standard and actual may be inserted in payroll sheets to furnish additional information.

When payrolls are vouchered, the Payroll account is debited and Vouchers Payable is credited for actual labor costs. When payrolls are distributed to production, Labor in Process is debited for the standard cost of direct labor used in production, the Payroll account is credited for actual direct labor cost, and the Labor Wage Variance and Labor Time Variance accounts are debited or credited for variances between standard and actual direct labor costs.

Thus, if the summary of time tickets or the payroll for a week shows a total direct labor cost of $1,320, composed of 1,200 actual direct labor hours at $1.10 an hour, the actual wage rate, while the standard requirements for the work completed are 1,000 hr. at $1 or a total of $1,000, the general ledger entry is as follows:

Labor in Process	$1,000	
Labor Wage Variance	120	
Labor Time Variance	200	
Payroll		$1,320

The Labor in Process account is debited for the standard labor cost, *i.e.*, the standard time multiplied by the standard wage rate. The account is credited and Finished Goods is debited for the standard cost of direct labor applied to goods completed and transferred to finished stock during the period. When goods are sold, Cost of Goods Sold is debited and the Finished Goods account is credited at standard cost.

Accounting for Overhead Expenses.—Material and Labor variances reflecting differences between standard and actual conditions can be computed daily or weekly, but difficulties are encountered when an attempt is made to isolate overhead expense variances before the end of each accounting period. Some actual overhead expenses such as repairs, supplies, and indirect labor may be recorded daily, but the majority of expense items, typified by taxes, rent, depreciation, power, and insurance, are recorded monthly. Therefore the most satisfactory time for the derivation of overhead variances is at the end of each accounting period.

The plan is to apply the standard overhead rate, computed at the beginning of the period, to production as it is completed and transferred to finished stock. A standard rate per direct labor hour or machine-hour is preferred, since the majority of overhead expenses accrue on the basis of time, but frequently, as an economy measure, a standard percentage per dollar of direct labor cost is used.

When the standard overhead rate is applied to production, a general ledger entry is made debiting Overhead Expense in Process and crediting Overhead Expense or, if preferred, Standard Overhead Expense for the standard overhead applied. Through the media of voucher register entries during the accounting period and through the media of adjusting journal entries at its close, actual overhead expenses are amassed as debits in the Overhead Expense account and in detail in overhead expense standing orders or in subsidiary ledger accounts. At the end of the period total actual overhead expenses appear on the debit side of the Overhead Expense account, while the total standard overhead applied to production during the period is shown as a credit in the Overhead Expense account or as a credit in the Standard Overhead Expense account if such an account is used. The balance of the Overhead Expense account represents variances in the form of overhead expense—budget variance, overhead expense—idle capacity variance, and overhead expense—production efficiency variance. The variances are computed in a manner identical with the methods explained in the present chapter.

As an example, it may be assumed that the standard overhead rate for the budget period was computed as follows:

$$\frac{\text{Standard overhead for budget period}}{\text{Standard direct labor hours for budget period}} = \frac{\$750.00}{1{,}500 \text{ hr.}}$$

$$= \$0.50 \text{ per hour.}$$

The actual direct labor hours per payroll totaled 1,200, and the standard direct labor hours were 1,000.

In order to charge work in process for the standard overhead expense, the standard hours of direct labor, totaling 1,000, are multiplied by $0.50 an hour, the standard overhead rate, and the following entry is made:

Overhead Expense in Process	$500	
Overhead Expense		$500

Actual overhead is recorded as follows:

Overhead Expense	$800	
Appropriate accounts, such as Vouchers Payable, Reserve for Depreciation, Taxes Accrued, and Prepaid Insurance		$800

The entry for overhead variances is as follows:

Overhead Expense—Budget Variance	$ 50	
Overhead Expense—Idle Capacity Variance	150	
Overhead Expense—Production Efficiency Variance	100	
Overhead Expense		$300

The overhead expense—budget variance of $50 is computed by subtracting the standard overhead expense of $750 from the actual overhead expense of $800. The overhead expense—idle capacity variance is obtained by subtracting the 1,200 actual direct labor hours from the 1,500 standard direct labor hours per budget and by multiplying the remainder of 300 hr. by the standard overhead expense rate of $0.50 an hour. The overhead expense—production efficiency variance of $100 is derived by subtracting the 1,000 standard hours of direct labor from the 1,200 actual direct labor hours per payroll and by multiplying the 200 hr. of excess time used in production by the standard overhead rate of $0.50 per hour.

The Overhead Expense in Process account is credited and Finished Goods is debited for the standard cost of overhead expense applied to production completed and transferred to finished stock. The Cost of Goods Sold account is debited and Finished Goods is credited for the standard cost of goods sold during the period.

Other Standard Cost Procedures.—As indicated in connection with Method I, there are other classifications of work in process which may be used in lieu of a Materials in Process, a Labor in Process, and an Overhead Expense in Process account. Other possibilities include the use of three work in process accounts for each production department, one each for material, labor, and overhead; a work in process account for each product or line of products; and three work in process accounts for each product or line of products.

Standard Cost Statements and Reports.—Standard costs must be adapted to the needs and requirements of the management of each particular enterprise. The effectiveness of a standard cost system is largely dependent upon the completeness of the cost reports which measure factory performance and upon the use made of such reports by management in directing and correcting factory operations.

The type of standard cost accounting system employed is an important factor in the valuation of inventories and in the preparation of operation cost statements. If Method I is selected as the most suitable plan, raw-materials inventories are costed at actual quantity and actual cost, work in process and finished goods inventories are shown at standard cost, and the standard cost of cost of goods sold is represented by a debit in the Cost of Goods Sold account. Method II is an accounting plan

whereby raw materials inventories are valued at actual quantity and standard price, while work in process inventories, finished goods inventories, and cost of goods sold are costed at standard. In either case, before periodic statements are prepared, the accounting records are subject to adjustment for variances between actual and standard costs. In general, it is recommended that material price and labor wage variances should be apportioned to inventories and to cost of goods sold in propor-

EXHIBIT 71
PROFIT AND LOSS STATEMENT
(Based on Standard Costs)
June, 19—

Net sales			$20,000
Less: cost of goods sold:			
Direct materials (standard)	$ 5,000		
Add: material price variance	100	$ 5,100	
Direct labor (standard)	$12,000		
Add: labor wage variance	600	12,600	
Overhead expense (standard)		6,000	
Cost of production, standard quantity and time		$23,700	
Less: inventories (standard):			
Work in process	$ 1,500		
Finished goods	5,500		
	$ 7,000		
Add: material price variance	140		
Labor-wage variance	275	7,415	
Cost of goods sold, standard quantity and time			16,285
Gross profit on sales, standard quantity and time			$ 3,715
Add: variances below standard cost:			
Overhead expense—budget variance			500
			$ 4,215
Less: variances in excess of standard cost:			
Material quantity variance		$ 300	
Labor time variance		500	
Overhead expense—idle capacity variance		800	
Overhead expense—production efficiency variance		400	2,000
Gross profit on sales, actual costs			$ 2,215
Selling and administrative expenses			1,500
Net profit from operations			$ 715

tion to the value or quantity of goods represented by each stage of operation; material quantity and labor time variances should be transferred directly to Profit and Loss; overhead expense—budget variance and overhead expense—idle capacity variance should be shown as deferred items or transferred to Profit and Loss, depending upon the reasons for their existence; and overhead expense—production efficiency variance should be treated as a Profit and Loss item.

Exhibit 71 is a profit and loss statement prepared to show gross profit and sales at both standard and actual costs according to Method II, when raw materials inventories are carried at actual quantity and standard price. Selling and administrative expenses are not shown in detail in the statement.

In order that a system of standard costs may be of maximum value to management, provision should be made for the preparation of daily, weekly, and monthly reports which will exhibit variances from standard for each of the elements of cost for each department and operation. The principle of exception, which is an important characteristic of standard costs, can be used to advantage in the preparation of reports which should show only the variations from standard performance.

Daily standard cost reports should direct the attention of foremen and supervisors upon the person or persons responsible for off-standard conditions. They may be designed to focus attention upon either the job or the operation, or both.

Reports for department heads and minor executives should be prepared weekly or biweekly and should be summarizations of the period's production activities classified by departments and operations. They should be detailed and should show definitely the workers, groups of workers, and supervisors responsible for substandard or above-standard operations.

Reports for superintendents and major executives may be prepared weekly, bimonthly, or monthly and should be in the nature of summaries of the period's production. There should be a recapitulation of the detailed operating conditions shown in interim reports from which favorable or unfavorable trends may be determined.

Questions

1. What advantages are attributed to Method I? Give in outline form the accounting procedure for Method I.

2. Explain how each of the following variances is determined:

a. Material price variance.
b. Material quantity variance.
c. Labor wage variance.
d. Labor time variance.
e. Overhead expense—budget variance.
f. Overhead expense—idle capacity variance.
g. Overhead expense—production efficiency variance.

3. Discuss the proper disposition of variances, indicating various circumstances which may be accountable for each variance and the proper treatment under each condition.

4. Indicate two other methods of accounting for standard costs by which work in process accounts are charged for actual cost of production and are credited for standard cost of work completed.

5. Describe briefly the standard cost accounting procedure whereby work in process accounts are charged with standard costs and credited with standard costs, variances being computed prior to entries in work in process (Method II).

6. Explain two methods of accounting for materials in accordance with Method II. What advantages may be attributed to each?

7. What procedure is followed in accounting for labor? How and when are variances computed?

8. Explain the procedure used in accounting for overhead expenses.

9. What types of standard cost statements should be prepared? How can each statement be used by management for purposes of control?

Problem 1

The Middletown Manufacturing Co. manufacturers an automobile accessory known as Triplex and sells the entire output to jobbers. The company has a standard cost system. The standard unit cost of the product by cost elements is as follows:

Direct materials	$1.80
Direct labor (2½ hr. @ 60¢ per hour)	1.50
Factory overhead expense (2½ hr. @ 50¢ per hour)	1.25
Total standard cost per unit	$4.55

The selling price per unit is $7.50. The production budget for the year contains an estimate of 20,000 units to be completed in 50,000 hr. of labor operations costing $30,000. The factory overhead expense budget contains a estimated total overhead for the year of $25,000.

During January the actual costs and conditions of operation were as follows:

Number of units completed, 2,000.

Inventory of work in process on Jan. 31, 30 units upon which all material and one-half of labor and overhead expense have been applied.

Materials requisitioned from stock, $3,700; material prices have not changed since standard material prices were computed.

Direct labor costs: 5,000 hr. @ 62¢ an hour or a total of $3,100.

Factory overhead expenses, $2,600.

During January 1,500 units were sold on account for $7.50 per unit.

Selling expenses amounted to $1,000, and general administrative expenses totaled $1,500.

The company uses three work in process accounts, one account for each element of cost; the work in process accounts are debited for actual costs and credited for standard costs.

a. Prepare journal entries for all transactions for the month.

b. Submit ledger accounts including variance accounts for each type of variation between actual and standard costs.

Problem 2

The Nome Corp. is engaged in the production of an article known as Kapse. A standard cost system, based on a monthly production, is used. The standard monthly production is 40,000 Kapse; the standard overhead expense is $140,000. The first-in, first-out method is used in filling requisitions. You are asked to present journal entries and accounts giving recognition to the following facts:

The standard cost card of product Kapse is as follows:

Material:	
4 pieces of R @ 20¢	$0.80
Labor:	
5 hr. @ 40¢	2.00
2 hr. @ 90¢	1.80
Overhead expense:	
7 hr. @ 50¢	3.50
Cost	$8.10

The firm charges work in process accounts at actual and credits them with standard costs.

The transactions for April are as follows:

1. Purchases:	
100,000 of R @ 21¢	$ 21,000
80,000 of R @ 17¢	13,600
	$ 34,600
2. Material used: 136,000 units of R.	
3. Labor used per payroll:	
160,000 hr. @ 38¢	$ 60,800
70,000 hr. @ 88¢	61,600
	$122,400
4. Production completed, 32,000 Kapse.	
5. Closing inventory: 4,000 Kapse, ¼ complete as to material, labor, and overhead expense.	
6. Depreciation	$ 24,000
Taxes	20,000
Power and light	45,000
Heat	10,000
Telephone	5,000
Salaries and indirect labor	36,000
	$140,000
7. Sales: 22,000 Kapse:	
10,000 @ $9.90	$ 99,000
12,000 @ 10.00	120,000
	$219,000
Direct selling expenses, $1.34 per Kapse	$ 29,480
General selling expense	21,000
	$ 50,480

Problem 3

The Non-rust Grave Vault Co. manufactures a standard casket. Standard overhead expenses for the month of May are $15,000 while standard production for the month is 50,000 direct labor hours. The standard cost card for the product shows the following:

Materials:	
4 pieces of A @ $5.00	$20.00
2 pieces of B @ 3.00	6.00
5 pieces of C @ 0.50	2.50
	$28.50
Labor:	
10 hr. @ $0.75	7.50
Overhead expenses:	
10 hr. @ $0.30	3.00
	$39.00

The following transactions occurred during the month:

1. Materials purchased:
   40,000 pieces of A @ $4.75.
   20,000 pieces of B @ 3.90.
   30,000 pieces of C @ 0.65.
2. Material requisitioned:
   22,000 of A.
   10,000 of B.
   25,000 of C.
3. Labor: 60,000 hr. @ $0.70.
4. Overhead expense:

Depreciation expense	$ 1,000
Power and light	2,500
Taxes	750
Supplies	7,250
Insurance	500
Salaries and indirect labor	5,000
	$17,000

5. Production completed during month, 5,000 units.
6. Work in process inventory:
   100 units ¼ completed for labor and overhead; materials A and B have been applied.
   200 units ⅔ completed for labor and overhead; all material has been applied.
7. Sales, 4,500 units at $50 per unit.

a. Present journal entries debiting work in process accounts with actual cost and crediting them with standard cost.

b. Submit ledger accounts.

c. Explain the possible causes of variances and indicate how variances may be disposed of at the end of the month.

Problem 4

1. Outline of accounting procedure for October for the Suntile Production Co.

a. Prepare journal entries to charge work in process accounts with actual costs and credit with standard costs.

b. Analyze and record variations from standard costs.

c. Dispose of variances.

2. Standard cost card:

PRODUCT X

Material:		
5 pieces of a @ $1.50	$7.50	
7 pieces of b @ 1.00	7.00	$14.50
Labor:		
10 hr. @ $0.75		7.50
Overhead expense:		
10 direct labor hours @ $0.80		8.00
Total standard cost		$30.00

The standard factory overhead expense rate is calculated as follows:

$$\frac{\text{Standard overhead expense}}{\text{Standard labor hours of operation}} = \frac{\$8,800}{11,000} = \$0.80 \text{ per hour.}$$

3. Transactions for month:
   Purchases, per invoices:
   6,000 pieces of a @ $1.45.
   7,500 pieces of b @ 1.03.
   Materials used, per requisitions, at actual:
   5,500 pieces of a @ $1.45.
   6,500 pieces of b @ 1.03.
   Direct Labor, per payroll:
   10,500 hr. @ $0.77.
   Factory overhead expense incurred, $8,500.
   Sales, 900 units @ $45.
4. Production:
   950 units completed.
   100 units in process—only material a has been used; ½ completed as to labor and factory overhead expense.
5. Analysis of variances:

Material price variance—due to change in market value of materials.
Labor price variance—due to change in labor market.
Overhead Expense Variance—due to business efficiency.

Problem 5

Determine the allocation of the variance accounts for the Suntile Co., Prob. 4, assuming that only 500 units have been sold during October. Present all journal entries which differ from those in Prob. 4.

Problem 6

The production of the Lawrence Paper Co. consists mostly of specific orders, but three standard boxes are manufactured for stock: the No. 2 can box, the No. 63 butter box, and the 100 size chick box. These three boxes are termed products A, B, and C, respectively. The company uses a standard cost accounting system with a work in process account, a finished goods account, and a variance account for each standard product. The work in process accounts are charged for production at actual cost and credited for completed production at standard costs.

The standard cost cards of the three boxes contain the following information. Standards are per M finished boxes.

No. 2 Can Box—Product A

Material, 7,100 sq. ft., of QCR board @ $5.85 per M sq. ft...	$ 41.535
Labor, 1⅔ hr. @ 60¢ per hour	1.00
Overhead expense, 1⅔ hr. @ $2.40 per hour	4.00
Total standard cost	$ 46.535
Selling price	$ 67.50

No. 63 Butter Box—Product B

Material, 9,200 sq. ft. of XJX board @ $7.65 per M sq. ft...	$ 70.38
Labor, 4 hr. @ 60¢ per hour	2.40
Overhead expense, 4 hr. @ $2.40 per hour	9.60
Total standard cost	$ 82 38
Selling price	$117.00

100 Size Standard Chick Box—Product C

Material, 12,900 sq. ft. of ZCE board @ $5.25 per M sq. ft...	$ 67.725
Labor, 9 hr. @ 60¢ per hour	5.40
Overhead expense, 9 hr. @ $2.40 per hour	21.60
Total standard cost	$ 94.725
Selling price	$182.50

On Jan. 1, there were no beginning inventories of work in process. Finished goods inventories, figured at standard costs, consisted of 7,500 boxes of product A, 7,500 boxes of product B, and 4,000 boxes of product C.

The standard overhead expense and production budgets for January contain the following estimates:

	Product A	Product B	Product C
Overhead expense	$1,200.00	$115.20	$432.00
Hours of direct labor	500	48	180
Units of production	300,000	12,000	20,000

Production for January is summarized as follows: Product A, 285,000 boxes; product B, 13,000 boxes; product C, 21,500 boxes.

Direct materials consumed during January consisted of:

Product A: 2,024,500 sq. ft. of QCR @ $5.90 per M sq. ft.	$11,944 55
Product B: 120,600 sq. ft. of XJX @ $7.67 per M sq. ft.	925.00
Product C: 278,350 sq. ft. of ZCE @ $5.25 per M sq. ft.	1,461.34
	$14,330.89

Direct labor time and cost for January are summarized as follows:

Product A: 520 hr. @ 62¢ per hour	$ 322.40
Product B: 47 hr. @ 64¢ per hour	30.08
Product C: 181 hr. @ 57¢ per hour	103.17
	$ 455.65

Actual overhead expenses for January are as follows: product A, $1,250.00; product B, $110.00; product C, $450.00.

Sales on account consisted of: product A, 290,000 boxes; product B, 15,500 boxes; product C, 21,000 boxes.

a. Prepare journal entries to record all transactions for January.

b. Submit general ledger accounts.

c. Prepare a schedule exhibiting in detail variances from standard costs for each product.

Problem 7

The American Novelty Co. manufactures three products which are coded as A, B, and C. The company uses a standard cost accounting system with a work in process account, a finished goods account, and a variance account for each product. The work in process accounts are charged for production at actual cost and credited for completed production at standard cost.

The standard cost cards of the three products contain the following information:

Product A		Product B		Product C	
Material, 5 units of x @ 10¢ per unit	$0.50	Material, 3 lb. of y @ 30¢ per lb.	$0.90	Material, 10 units of z @ 8¢ per unit	$0.80
Labor, 2 hr. @ 60¢ per hour	1.20	Labor, 2½ hr. @ 80¢ per hour	2.00	Labor, 4 hr. @ 75¢ per hour	3.00
Overhead expense, 2 hr. @ 80¢ per hour	1.60	Overhead expense, 2½ hr. @ $1 per hour	2.50	Overhead expense 4 hr. @ 50¢	2.00
Total standard cost	$3.30	Total standard cost	$5.40	Total standard cost	$5.80
Selling price	$5.00	Selling price	$7.00	Selling price	$8.00

On Jan. 1, 19—, there were no beginning inventories of work in process. Finished goods inventories, figured at standard costs, consisted of 2,500 units of product A, 500 units of product B, and 750 units of product C. The overhead expense and production budgets for the fiscal year contain the following estimates:

	Product A	Product B	Product C
Overhead expense	$32,000	$30,000	$50,000
Hours of direct labor	40,000	30,000	100,000
Units of production	20,000	12,000	25,000

Production for January is summarized as follows: product A, 2,000 units; product B, 1,100 units; and product C, 2,200 units. Sales on account consisted of 3,000 units of product A; 1,200 units of product B; and 1,500 units of product C.

Direct materials consumed during January are summarized as follows:

Product A: 10,500 units of x @ 11¢ per unit.

Product B: 3,200 lb. of y @ 32¢ per lb.

Product C: 23,000 units of z @ 7¢ per unit.

Direct labor time and cost for January is summarized as follows:

Product A: 4,200 hr. @ 60¢ per hour.

Product B: 2,700 hr. @ 85¢ per hour.

Product C: 8,900 hr. @ 75¢ per hour.

Actual overhead expenses for January are as follows: product A, $3,000; product B, $2,800; and product C, $4,500.

a. Prepare journal entries to record all transactions for January.

b. Submit general ledger accounts.

c. Prepare a schedule exhibiting in detail variances from standard costs for each product.

d. Submit a statement of manufacturing cost and a cost of goods sold statement assuming that overhead expense—budget variance is due to seasonal conditions.

Problem 8

The Vinu Manufacturing Co. produces one standard product, the musical alarm clock. Work in process accounts are debited and credited at standard. Material is carried in the inventory account at actual quantity and standard price. A standard cost card shows:

Material:		
Metal for case a, 1	@ $0.05	
Metal for parts b, 1	@ 0.10	
Glass c, 1	@ 0.05	$0.20
Labor: ⅔ hr. @ $0.60		0.40
Overhead expense: ⅔ hr. @ $0.75		0.50
Total standard cost		$1.10

$$\frac{\text{Standard overhead expense}}{\text{Standard direct labor hours}} = \frac{\$4,500}{6,000} = \$0.75.$$

Transactions for June include:

1. Material purchased:
   10,500 a @ 5½¢.
   10,000 b @ 11¢.
   12,000 c @ 4½¢.
2. Material requisitioned:
   9,500 a @ 5¢.
   9,050 b @ 10¢.
   9,200 c @ 5¢.
3. Payroll: 6,250 hr. @ 62¢.
4. Overhead expense: $4,550.
5. Sales: 9,000 items @ $1.50 each.
6. Selling expense: $750.
   Administrative expense: $1,200.
7. Production:
   9,000 completed units.
   500 units ⅗ completed as to labor and overhead expense; material a has been applied.

Required:

Journal entries showing determination of variances.

Problem 9

Refer to Prob. 2. Use the information given in the problem as a basis for the preparation of journal entries and ledger accounts; debit and credit work

in process accounts at standard cost; assume that materials are valued at standard price in the stock records.

Problem 10

Refer to Prob. 6. Use the information given in the problem as a basis for the preparation of journal entries and ledger accounts; debit and credit product work in process accounts at standard cost; materials are valued at actual price in the stock records.

Problem 11

The Western Manufacturing Co. produces a single product, X. The standard cost of the product is as follows:

Material: 1 piece	@	$4.50	$4.50
Labor: 3 hr.	@	0.75	2.25
Overhead: 3 hr.	@	1.00	3.00
			$9.75

$$\frac{\text{Standard overhead expense}}{\text{Standard labor hours}} = \frac{\$2{,}925}{2{,}925} = \$1 \text{ per hour.}$$

Production for month of July:

950 units completed.

100 units ½ completed as to labor and overhead; all material has been added.

Transactions for July:

1. Purchased material: 1,250 pieces @ $4.60.
2. Material requisitioned: 1,100 pieces.
3. Payroll: 2,950 hr. @ 80¢.
4. Overhead expenses: $3,100.
5. Sales: 500 units @ $15.

a. Show journal entries for month debiting and crediting work in process at standard.

b. Assuming no seasonal influences, dispose of variances according to strict accounting theory.

c. Prepare ledger accounts.

d. Present a monthly condensed profit and loss statement, assuming selling and administrative expenses of $1,500.

e. Prepare a cost of manufacturing statement and a cost of goods sold statement.

f. Prepare a balance sheet, assuming the following account balances on July 1: Cash, $5,000; Accounts Receivable, $1,000; Vouchers Payable, $2,000; Capital Stock, $4,000.

PART III

ACCOUNTING FOR DISTRIBUTION AND ADMINISTRATIVE COSTS

CHAPTER XVIII

DISTRIBUTION COST ACCOUNTING

Need for Control of Distribution Costs.—Before 1920 the great problem of industry was production. During the rapid upward swing of prices brought about by the World War conditions and by the expansion of credit, the increased purchasing power of consumers and the needs of warring countries created a demand for manufactured products which producers filled by operating their plants to capacity and by plant expansions. Problems of production were paramount; distribution problems were relatively unimportant.

After 1920, however, the emphasis in business shifted from production to distribution. Technological improvements, lower raw material costs, and the increased efficiency of factory operations through the adoption of scientific methods of factory management brought about a decline in production costs and increased the productive capacity of plants. Manufacturers, faced with a decreased foreign market, loss of war contracts, decreased purchasing power of consumers, and excess plant capacity, began to stress distribution. As a result there has been a tendency for distribution costs to rise relatively and for production costs to decline. Sales departments have been increased in personnel; advertising expenditures have been expanded; customers have been bombarded by direct-by-mail literature and canvassed by highly paid salesmen; various demonstration and promotional schemes have been tried; and trade territories have been widened, with a resultant increase in transportation and shipping expenses. In some cases manufacturers have discarded such traditional middlemen as the wholesaler or jobber and have attempted to find more direct channels of distribution for their products. Many experiments have been made, and trial-and-error methods have been used without adequate means of checking their efficiency. The vast expansion of distribution processes has resulted in excessive expenses and much waste.

Scientific management has already entered the factory with well-planned budgets, elaborate systems of cost accounting, piece-rates, and efficient planning departments, but little has been done to perfect a scientific method of control over selling expenses. In many manufacturing concerns men and machines can be geared up to specification work programs in such a way that the possibility of inefficiencies is reduced to a

minimum, but this specification method cannot be applied to the selling end of the business because the human factor in selling is greater than in production. Cost accounting for distribution offers as great and fruitful a field for the extension of scientific management as has been afforded in manufacturing during the last 20 years.

The Robinson-Patman Act.[1]—Recent legislation in the form of the Robinson-Patman Act of 1936 has increased the interest of management in distribution cost analysis and has made a knowledge of distribution costs a prerequisite to the intelligent and proper determination of prices.

The Robinson-Patman Act is a form of antitrust law enacted for the purpose of aiding in the preservation of the competitive economic system. The purpose of the act was described in the preamble of the bill introduced in Congress in the following manner:

> Making it unlawful for any person engaged in commerce to discriminate in price or terms of sale between purchasers of commodities of like grade and quality; to prohibit the payment of brokerage or commission under certain conditions; to suppress pseudo advertising allowances; to provide a presumptive measure of damages in certain cases; and to protect the independent merchant, the public whom he serves, and the manufacturer from whom he buys, from exploitation by unfair competitors.

Essentially the act attempts to prevent discrimination between customers who are in direct competition in selling products or services purchased from a manufacturer or wholesaler. Thus a person selling a product to two or more customers who compete in the resale of the product must not discriminate so as to give an unfair advantage to one or more of these customers in preference to others. The forms of discrimination include: price differences, discounts, delivery service, allowances for services, advertising appropriations, brokerage or commissions, and consignment policies.

The act does not prohibit price differentials which are due to differences in costs. The following statement is included in Sec. 2:

> Nothing herein contained shall prevent differentials which make only due allowances for differences in the cost of manufacture, sale, or delivery resulting from the differing methods or quantities in which such commodities are to such purchasers sold or delivered.

Thus if lower costs result to the seller because of the elimination of service to the buyer, because of quantity purchases, because of the methods by which delivery is made, or because of other marketing

[1] For a comprehensive analysis and interpretation of the various sections of the act see Wright Patman, "The Robinson-Patman Act," Ronald Press Company, New York: and Benjamin Werne (editor), "Business and the Robinson-Patman Law," Oxford University Press, New York.

methods, the seller has a legal right to pass on to the buyer those savings in the form of a correspondingly lower price. Consideration must be given to such factors as the quality, service, advertising methods, channels of distribution, and the type of purchasers.

Since the act does make allowances for differences in costs, it is important that the managements of concerns performing distribution functions obtain cost statistics regarding their distribution costs. Improvement in distribution cost accounting methods has resulted since the passage of the act. Distribution cost analyses by lines of products, territories, customers, quantities, qualities, and special promotional efforts are necessary if a manager is to have complete information concerning his firm's distribution methods for price determination. Such information is necessary if management is to be fortified against improper pricing, which may be termed "discrimination" under the terms of the act. The Robinson-Patman Act will continue to be an important motivating force in creating interest in and encouraging the development of improved distribution cost accounting methods for large and small concerns alike.

Distribution Costs.—When a product is placed in a salable state, it is generally agreed that the functions of production or manufacturing have been terminated and that the distribution function has begun. In the manufacturing of a typewriter or furniture that must be shipped to dealers, the cost of manufacture includes the crating of the product ready for shipment. In bottling works the manufacturing process includes the placing of the bottles in cases; canning factories include as a cost of production the packing of cans and bottles in cases; and seed companies usually consider the packaging of seeds for retail sale as a part of production. There are many borderline costs that defy accurate classification as to production or distribution costs.

Distribution cost statistics of many types may be made available to management. Distribution costs may be classified and accounted for in terms of sales departments, territories, salesmen, lines of products, sales and production orders, and customers. One or more of these cost classification units may be used, depending upon the needs of management in controlling distribution functions and the cost of accumulating such statistics.

An illustration of a comprehensive analysis of sales and distribution costs is to be found in the case of a West Coast bakery. This large enterprise manufactures over 150 different products and distributes them directly to retailers. An analysis of sales, distribution costs, and profit and loss is made in terms of the following classifications: sales outlets, including the company's salesmen's division, the independent distributor's division, the mail order division, and the wholesale division; territories; salesmen; and the four main classes of products: cakes, plain

cookies, fancy cookies, and crackers. The statistics are compiled monthly and are compared with those of preceding months and years.

A System of Accounting for Distribution Costs for Sales Departments, Territories, and Orders.—In order to illustrate records and procedures required in the operation of a distribution cost accounting system, a detailed explanation of a cost system for an enterprise requiring cost statistics for its sales departments, territories, and sales orders is given in succeeding sections.

A system of internal check should be an integral part of any cost system. This is possible only through a division of accounting work, which signifies a separation of accounting records through the use of controlling accounts and subsidiary records. A chart, Exhibit 72, is presented, showing the accounts which may appear in the general ledger and the subsidiary records that each account controls. General ledger controlling accounts are shown above the double line, drawn horizontally across the page; subsidiary records are presented on the lower half of the page.

Study of the chart will disclose the following controlling account and subsidiary record relationships:

a. An account in the general ledger, termed Selling Expense, which summarizes all the selling expenses at the end of each month. This account controls a subsidiary ledger composed of standing orders or analysis sheets, upon which selling expenses of each class are entered. There should be a standing order for each type of expense, a separate sheet being used for each expense, such as advertising, sales salaries, supplies, rent of sales offices, and traveling expenses.

b. A group of accounts in the general ledger for sales departments that control a subsidiary ledger composed of standing orders or analysis sheets. There may be an account in the general ledger for each sales department such as the advertising department. Each department controlling account shows in summary the total actual selling expenses of the department for the month; in the standing order for that department is tabulated in detail the selling expenses charged to the department.

c. An account in the general ledger for each territory that summarizes the selling expenses for the territory at the end of each period. Each territorial account controls the standing order that shows in detail the selling expenses apportioned to that territory.

d. A profit and loss account for each territory to summarize the selling expenses charged to cost of goods sold in the territory during the month. Manufacturing costs, administrative expenses, and sales for the territory are also included in the account. Each territorial profit and loss account controls a territorial profit and loss analysis sheet.

e. A General Profit and Loss account in the general ledger to which the territorial profit and loss accounts are finally closed.

Accounting for Selling Expenses.—From day to day the various selling expenses should be recorded in the accounting records in somewhat the following manner. The supplies should be issued from the stockrooms only upon written requisitions that show the quantity, cost, and the

departments or territories using the materials. At the end of the month, from the requisitions received daily, the stockkeepers may send a summary report of the supplies requisitioned by each department and by each territory to the general ledger bookkeeper, who makes an entry in the journal debiting the Selling Expense account and crediting Materials for the total cost of the supplies. The supplies summary sheet may be used as a basis for the detailed entries in the standing order for supplies. In this standing order, which is controlled by the Selling Expense account, each department and territory is charged for the cost of supplies used.

Salaries paid to the personnel of the sales divisions are tabulated each week or month upon payroll sheets that show the amount of salaries paid for the services rendered in each sales department and territory. At the

PRIMARY STANDING ORDER No.____ Newspaper advertising Year: 19__

Territory	Jan.	Feb.	Mar.	Apr.	May	June
Oklahoma						
Kansas						
Missouri						
Colorado						
Iowa						
Total						

Exhibit 73.

end of the month the summary payroll sheets may be used as a basis for a journal entry debiting the Selling Expense account and crediting Payroll and also for entries in the standing order for salaries, showing the amount of salaries paid to employees in each sales department and each territory. Two standing orders are illustrated. The first form for newspaper advertising, Exhibit 73, is typical for the class of expenses that are assignable directly to the territories, no part of which should be charged to the sales departments. The second standing order for sales salaries, Exhibit 74, is typical of a number of standing orders that require a distribution of expenses to both departments and territories.

Other selling expenses, such as newspaper, magazine, billboard, radio advertising, catalogue costs, donations, shipping expenses, repairs, and dues, supported by bills or invoices, are typical of the class of expenses that are entered in the voucher register, when vouchered for payment, as debits to the Selling Expense account and as credits to Vouchers Payable. Each expense is entered in a separate subsidiary standing order, where the total expense is apportioned to the departments and territories listed in each standing order.

Another group of selling expenses, including bad debts, rentals, depreciation, taxes, and insurance, is charged to the Selling Expense account through monthly adjusting entries made in the journal. Each of these selling expenses is entered in a standing order for this class of expense, the total being allocated to each territory and department on the basis of value, floor space, or other distribution bases.

PRIMARY STANDING ORDER No.____ Sales salaries Year: 19__

Department or territory	Jan.	Feb.	Mar.	Apr.	May	June
Department:						
Sales (general)						
Advertising						
Shipping						
Total department expenses						
Territory:						
Oklahoma						
Kansas						
Missouri						
Colorado						
Iowa						
Total territory expenses						
Total sales salaries						

Exhibit 74.

Bases for the Distribution of Selling Expenses to Sales Departments and Territories.—The establishment of distribution bases should be undertaken through the cooperation of the sales manager and executives in charge of accounting. When bases of apportioning expenses have been determined, these bases will be used to distribute expenses until the method is proved inequitable or until changed conditions require the formation of a better distribution method.

It may be suggested as a general working principle that the more detailed the allocation and the greater the number of factors or bases used the more accurately the distribution work will be done. It is possible to lump all the selling expenses together and to distribute them to territories on the basis of total sales for each territory. Such a distribution would be easy, but the results would not be very satisfactory, because some territories receive much more service from some selling expenditures than from others. It is a matter of executive judgment to determine bases of distribution that are practical, easily used, and equitable. An error in the selection of a distribution base may result in the

EXHIBIT 75

SUGGESTED BASES FOR THE DISTRIBUTION OF SELLING EXPENSES TO SALES DEPARTMENTS AND TERRITORIES

Selling expense	Standing orders charged	Distribution base
Newspaper and magazine advertising	Territories	Actual expenditures and circulation coverage of publications
Local radio advertising	Territories	Actual expenditures in each territory
National radio advertising	Territories	Population coverage of territories by radio network
Billboard advertising	Territories	Actual expenditures in each territory
Catalogues	Territories	Sales; number of customers
Public relations, donations, etc.	Territories	Sales
Selling salaries	Sales departments and territories	Actual salary expenditures for each division
Commissions and bonuses	Territories	Actual commissions and bonuses earned by the personnel in each division
Traveling expenses	Sales departments and territories	Actual traveling expenses for the personnel in each department or territory
Shipping expenses: freight, cartage, boxes, and packing supplies	Territories	Actual shipping expenses for each territory; or sales
Postage, stationery, supplies, telephone, and telegraph	Sales departments and territories	Actual expenditures for each division
Repairs	Sales departments and territories	Actual cost of repairs for each division
Rent of sales offices	Sales departments	Floor space
Rent of branch or territorial offices	Territories	Rental charge for space used by each territory
Depreciation	Sales departments and territories	Rate of depreciation and value of equipment and property used by each division
License fees	Sales departments and territories	License charges on equipment used by each division
Taxes on property	Sales departments and territories	Value of property used by each division
Insurance—fire	Sales departments and territories	Value of property used by each division
Insurance—automobile	Sales departments and territories	Actual insurance charges on automobiles used by each division

misstatement of departmental, territorial, and product costs through the application of incorrect amounts of selling expenses to the unit involved.

Although arbitrary bases of allocation cannot be set, it seems advantageous, in developing a system of controlling distribution costs, to suggest some factors for the apportionment of selling expenses to departments and to territories. The foregoing schedule, Exhibit 75, will serve as a guide in distributing selling expenses to sales departments and to territories.

Sales Departments and Territorial Standing Orders.—After distribution bases have been determined and selling expenses have been entered in the primary standing orders, the next step is the preparation of distribution costs by sales departments and by territories. It is not absolutely necessary to set up the sales departments' expense classification. All the primary selling expenses may be transferred directly to the territorial standing orders. If this is done, however, the management will not have available a detailed analysis of selling expenses for each sales department. In many cases it is the sales departments' expenses that constitute a large share of the total distribution costs, and often it is in these departments that a more adequate control of expense is necessary. The departmental standing orders facilitate a detailed expense analysis for each department by the management.

The best procedure is to classify primary selling expenses both by sales departments and by territories and then to distribute and to transfer the total sales departments' expenses to the territories in order that all selling expenses will be distributed to the territories. If the distribution accounting system is complete, there will be a standing order for each sales department and for each territory controlled by a corresponding account in the general ledger for the purpose of analyzing departmental and territorial selling expenses. The group of departmental and territorial standing orders will be termed "secondary standing orders." The plan is to use these subsidiary accounting records to classify the selling expenses by sales departments and by territories. As in the case of the primary standing orders, a column is used for each month or quarter.

The clerks should transfer from each of the primary standing orders the amount of that expense assigned to each department and to each territory to each departmental and territorial standing order. The secondary standing orders will exhibit in detail the amount of selling expense directly assigned to each department when the process is completed. The standing order for each territory will not show the total selling expenses assignable to that division until the sales department expenses are prorated to the territories. Thus the important information exhibited at this stage of the distribution process is the selling expenses shown in detail for each sales department and territory.

Exhibit 76 illustrates a secondary standing order for the sales accounting department which may be considered typical of the expense analysis sheets prepared for each department in the sales division.

SECONDARY STANDING ORDER NO.____ Sales accounting department

Year 19__

Class of expense	Jan.	Feb.	Mar.	Apr.	May	June
Salaries						
Travel						
Postage						
Stationery						
Supplies						
Telephone and telegraph						
Repairs						
Rent						
Depreciation						
Taxes						
Insurance						
Total dept. expenses						

Exhibit 76.

EXHIBIT 77

SUGGESTED BASES FOR THE DISTRIBUTION OF SALES DEPARTMENTS' EXPENSES TO TERRITORIES

Sales Departments	*Distribution Base*
Advertising	Sales or directly in cases of special advertising plans
Adjustment	Actual number of adjustments, or sales quotas
Billing	Actual number of invoices or statements
Collection	Actual number of collections, or sales or credit sales
Credit	Actual applications for credit, or sales, or actual credit sales or number of accounts
Dealer and jobber service	Number of dealers and jobbers, or sales
General sales	Sales
Order	Actual number of orders
Sales accounting	Sales or actual number of charges and credits
Sales correspondence	Sales
Training school for salesmen	Number of salesmen, or sales
Shipping	Actual number of shipments, number of articles, tonnage
Traffic	Actual number of routings, types of routings, and shipping claims
Warehouse	Actual number of orders, number of articles, and tonnage handled

Distribution of Sales Departments' Expenses to Territorial Standing Orders.—After total selling expenses have been determined for each

sales department, the next step is to allocate these departmental expenses to territories. The procedure is necessary in order to ascertain the total cost of operating each territory. The territorial standing orders already have a share of the selling expenses, obtained when the distribution of the primary standing orders was made to departments and to territories. Since the sales departments exist only to serve and to aid in obtaining sales, all the expenses of these departments are chargeable to territories.

SECONDARY STANDING ORDER No.____	Wisconsin				Year: 19__	
Class of expense	Jan.	Feb.	Mar.	Apr.	May	June
Selling expense directly charged:						
Salaries						
Traveling expenses						
Postage						
Stationery						
Supplies						
Telephone and telegraph						
Repairs						
Rent						
Depreciation						
Taxes						
Insurance						
Total direct charges						
Departmental apportioned charges:						
Advertising						
Adjustment						
Billing						
Collection						
Credit						
Dealer and jobber						
General sales						
Sales accounting						
Traffic						
Total apportioned charges						
Total selling expenses						

Exhibit 78.

The schedule, Exhibit 77, suggests bases for allocation of total sales department expenses to the territories. Each company has its own peculiar set of operating conditions which makes impossible any standardization of distribution bases. The problem is to determine those factors which can be estimated closely or measured actually and which exert the greatest influences upon the amount of expense sustained by each sales department for the benefit of territories.

After distribution bases have been determined, it is a clerical task to compute and to allocate the total of each sales departments' selling expenses to each territory. The amount charged to each territory will be entered in the standing order for that territory. When the work has been completed, the total selling expenses will be shown in the standing orders for the territories.

The territorial standing orders for Wisconsin, Exhibit 78, will typify analysis sheets of this class. There will be a similar sheet for each territory or branch.

Entries in General Ledger Accounts.—It has been explained how selling expenses have been classified by sales departments and territories in a group of standing orders or analysis sheets that are subsidiary to the general ledger account, Selling Expense. These primary standing orders for such selling expenses as salaries, supplies, and advertising provide information in summary form for the general ledger entry debiting each sales department account and each territory selling expense account and crediting the Selling Expense account for the share of the expense allocated to each division. After this journal entry has been made, the management has available the total cost of maintaining each sales department in the department accounts and the share of the selling expenses assigned to territories in the territorial expense accounts.

A second step in the closing process is the preparation of a journal entry debiting each territorial selling expense account and crediting each sales department account for the amount of sales departments expenses assigned to territories. The detail of the allocation is to be found in the secondary standing orders for territories where the distribution was made in accordance with selected bases.

Finally, a journal entry is required to transfer the total selling expense for each territory to the profit and loss account for the territory. Sales are classified and entered as credits to the territorial profit and loss accounts, the debit being to the Sales account; the cost of goods manufactured is debited to the profit and loss account for each territory and Finished Goods is credited; and the profit and loss accounts are debited for a share of the administrative expense, the credit being to the Administrative Expense account.[1] The territorial profit and loss accounts are finally closed into the General Profit and Loss account. The comparative form of profit and loss statement can be used advantageously to report the profit or loss for each territory and the net total for the period.

Distribution Costs by Salesmen.—For many concerns performing the functions of distribution, the analysis of selling expenses by territories offers an adequate control. There may be some companies that desire a more complete classification of distribution costs and a more

[1] The treatment of administrative expenses is explained in Chap. XX.

detailed analysis of profit possibilities. In addition to the allocation by territories, distribution costs may be classified by salesmen.

The further classification of the territorial selling expenses entails the allocation of each type of expense for each territory to the salesmen who operate in that geographical area. The territorial expenses may be divided into salesmen's direct expense and branch or territorial overhead. The direct expenses include such items as salesmen's salaries, commissions, special advertising, traveling expenses, telephone and telegraph, and supplies. This class of selling expenses can be allocated directly to each salesman.

The territorial overhead includes expenses incurred for the maintenance of the territorial office or offices. Expenditures for salaries, rent, repairs, depreciation, taxes, supplies, telephone and telegraph, and salaries paid to territorial executives are so classified, but expenses of sales departments such as advertising, adjustment, billing, collection, general sales, and traffic departments that have been charged to the territories are also included. All the expenses should be added together and apportioned in a lump sum to the salesmen upon an equitable distribution base. The territorial selling overhead expense may be distributed equally among the salesmen or may be apportioned on the basis of sales or sales quotas.

The equal division of the overhead among salesmen has ease of administration and simplicity in its favor. It is based on the theory that each salesman receives approximately the same benefit and supervision from the territorial or branch office. For example, if the territorial selling overhead expenses were $2,000 for January and if there were 10 salesmen, a charge of $200 would be made to each salesman as his share. Probably this method will be sufficiently accurate in some businesses, but it is not scientifically accurate since it does not recognize that some salesmen may have more profitable accounts, more densely populated or wealthier communities, and older and better developed territories.

A much superior method is that of apportioning selling overhead on the basis of sales quotas. Quotas may be determined for each salesman to measure his sales opportunities and to set a standard of performance. Differences in sales opportunities, in salesman's aptitudes, in training, and in size of territories are all considered in the computation of sales quotas. When sales quotas are used as a basis, each salesman is charged with the territorial overhead in the same ratio that his sales quota bears to the total sales quota of the territory. This method is more equitable and reveals more accurately the profit or loss for each salesman. For example, assume that a salesman A was allotted a sales quota of $15,000 and salesman B a quota of $10,000 for July and that their actual sales for the month were $12,000 each. If the selling overhead for July was

apportioned to the two salesmen on the basis of sales, each man would receive an equal share, but if the allocation was based on sales quotas, salesman A would receive three-fifths and B would receive two-fifths. Salesman B exceeded his quota by $2,000 whereas A failed to reach his quota by $3,000; thus the sales quota method of distribution of expense would show more clearly the efficiency of each salesmen when the profit and loss computations for salesmen were made.

Tabulation of the distribution of selling expenses to salesmen can be made in a standing order or analysis sheet for each salesman, such as the one suggested as Exhibit 79.

STANDING ORDER NO.____

Salesman: Robert Brown — Territory: Wisconsin

Year: 19__

Class of expense	Jan.	Feb.	Mar.	Apr.	May	June
Direct selling expense:						
Salary						
Commissions						
Traveling expenses						
Postage						
Stationery						
Supplies						
Telephone and telegraph						
Total direct expense						
Apportioned charges:						
Selling overhead expense for territory						
Total selling expenses						

Exhibit 79.

From individual standing orders for salesmen and from manufacturing and administrative expense records, there can be prepared a comparative profit and loss statement, showing profit or loss computations for individual salesmen in each territory.

Distribution Costs and Profit and Loss for Sales Orders.—The management of many concerns may find it advantageous to know the amount of selling expense incurred on each sales order for each territory as an aid in determining the most profitable territories and classes of orders. It may be valuable to show after the sale of an order in a particular territory the cost to manufacture, the amount of selling and administrative expense applied to the order, the total cost to make and to sell, and the profit or loss on the order. If a company's business was represented by large

orders, such an analysis might prove valuable for every order sold in each territory. In other concerns it might be practical to compute these cost and profit elements only on the large orders and to make tests by computing the costs on every fifth or tenth small order in each territory. To provide for the computation of costs on orders shipped into each territory, the amount of selling expense must be applied to each order by means of distribution rates.

Territorial Distribution Rates for Selling Expenses.—One basis for the computation of territorial distribution rates is net sales. The rate for distributing selling expenses to sales orders is obtained by dividing the total selling expenses for each territory by the total net sales for that territory. For example, if the total selling expenses for Texas for the month, as shown in the territorial standing order for Texas, were $50,000 and the net sales for Texas for the same period were $500,000, the distribution rate for Texas would be obtained by the following formula:

$$\frac{\text{Total selling expenses for Texas for June}}{\text{Total net sales for Texas for June}} = \frac{\$50{,}000}{\$500{,}000}$$

= 10 per cent, the selling expense distribution rate for Texas.

The distribution rate for each sales territory is used as each sales order is received. For example, if Jones, a salesman in the Texas territory, sends a sales order to the home office for $100 and the territorial distribution rate for Texas is 10 per cent of sales, the amount of $10 is added to manufacturing and administrative costs; thus the computation of the cost to make and to sell and of the profit or loss on the order is made possible.

Comparison of Bases for Distributing Selling Expense.—The distribution of selling expenses to sales orders or to products upon the basis of net sales for each territory is probably the most practical and satisfactory method, since it is easily computed and applied. The theoretical objection that selling expense is without direct relation to the price of goods sold can be made to this method. Goods that sell at a high price may require less selling cost than those that sell at lower prices; or the opposite may be true. Likewise, small sales orders may require more selling effort than large orders.

It is impossible to select an entirely satisfactory distribution base. In most cases there are greater objections and more difficulties with other bases of distributing selling expenses than with that of net sales. Other bases of distribution that may be suggested are as follows:

a. Manufacturing cost.
b. Number of sales or orders.

c. Quantity to be sold in terms of tons, pounds, thousand feet, or other units of weight or measurement.

d. Gross profit on sales.

If any of these bases are to be used, the distribution rate is determined by dividing the selling expenses for each territory by the selected base for the territory in question.

There is no relation between selling expenses and the cost of goods manufactured, since articles of high manufacturing cost may require less selling expense than do low-cost goods.

Most companies have such a variety of products to sell and the sales orders are so unequal in the total quantity of products sold that the number-of-sales-or-orders and the quantity-sold methods are not applicable. There is often no direct relation between selling expenses and the number of orders or quantity sold.

The method of gross profit on sales has more possibilities. If the markup or percentage of gross profit can be determined for the sales for each territory, the distribution of selling expenses by this method may be rather easily undertaken. The fact that it distributes a larger share of the selling expense to the more profitable products and a smaller share to the low-profit lines may be regarded as either an advantage of or an objection to this method, since the points of view of interested parties may be directly opposite.

The determination of the method of distributing territorial selling expenses depends upon the particular conditions and circumstances prevailing in the company in question.

Distribution Costs by Lines of Products.—The determination of costs and profits or losses by territories, salesmen, and sales orders is the most common form of distribution cost accounting, but it is possible to furnish management with valuable information by costing according to lines of products. Thus it is possible to segregate purchases, sales, and selling expenses by classes of products and to determine the cost of procuring, handling, and selling and the net profit or loss for each line. Management can then push profitable lines and can discontinue or take measures to increase the profitableness of merchandise handled at a loss. In many concerns the analysis of costs is limited to subsidiary records in the form of analysis sheets, but in other companies a purchases, a sales, an inventory, and a profit and loss account for each line of products are included in the general ledger.

The problems encountered in classifying selling expenses by lines of products are similar to those discussed in connection with the allocation of expenses to territories and salesmen. Very few expenses can be directly distributed, because most items of expense are incurred jointly for all products. Selling expenses, which can be directly identified with

a particular line of products, include: salaries of specialty salesmen, their commissions and travel expenses; some forms of advertising; warehouse or storage expenses; and depreciation of specialized equipment. The majority of the selling expenses are of the general overhead type, which have to be allocated in accordance with an arbitrary base such as net sales. In this group are salaries of office personnel, officers' salaries, supplies, telephone and telegraph, water, and repairs to buildings and equipment. Although net sales is not a satisfactory distribution base for expenses of a general nature, it is based on the ability-to-pay principle and is more equitable than other general distribution methods that can be selected.

THE CONSOLIDATED MANUFACTURING CO.
COMPARATIVE STATEMENT OF SELLING EXPENSES FOR SALES DEPARTMENTS
Month: January

Expense	Advertising department	Shipping department	Sales department	Total
Executive salaries	$300	$ 200	$ 560	$1,060
Clerical salaries and helpers	220	550	570	1,340
Insurance	7	15	18	40
Travel	15		100	115
Telephone and telegraph	30	9	185	224
Supplies	69	360	40	469
Rent	50	75	60	185
Depreciation of equipment	10	20	17	47
Total selling expense	$701	$1,229	$1,550	$3,480

Exhibit 80.

If a profit and loss account is maintained in the general ledger to accumulate sales, selling expenses, manufacturing costs, and administrative expenses for each line of products, these accounts will be closed into a General Profit and Loss account as a final step in the determination of the net profit or loss for the enterprise. A comparative profit and loss statement, exhibiting profit and loss elements by lines of products or merchandise, can be prepared for the management.

Monthly Statements.—Various types of cost statistics regarding distribution functions should be available to management at the end of each accounting period. Illustrations of statements that can be prepared for a business enterprise performing both manufacturing and distribution functions are presented as:

a. A comparative statement of selling expenses for sales departments (Exhibit 80).
b. A comparative statement of selling expenses for sales territories (Exhibit 81).

THE CONSOLIDATED MANUFACTURING CO.
COMPARATIVE STATEMENT OF SELLING EXPENSES FOR SALES TERRITORIES
Month: January

Expense	Ohio	Indiana	Illinois	Total
Sales salaries	$ 200	$ 250	$ 350	$ 800
Salesmen's salaries	300	275	475	1,050
Commissions	150	200	250	600
Insurance	10	12	18	40
Travel	200	175	225	600
Telephone and telegraph	20	15	30	65
Supplies	15	19	21	55
Rent			50	50
Depreciation of equipment	16	14	30	60
Total direct charges	$ 911	$ 960	$1,449	$3,320
Apportioned sales service department charges:				
Advertising department	$ 200	$ 150	$ 351	$ 701
Shipping department	389	340	500	1,229
Sales department	500	350	700	1,550
Total apportioned charges	$1,089	$ 810	$1,551	$3,480
Total actual selling expenses	$2,000	$1,800	$3,000	$6,800

Exhibit 81.

THE CONSOLIDATED MANUFACTURING CO.
COMPARISON OF SALESMAN PERFORMANCE
Territory: Ohio Month: January

Salesman	Selling expenses		Administrative expenses	Cost of goods sold	Total cost	Net profit or loss	Net sales
	Direct charges	Indirect charges					
Roe, John	$650	$450	$400	$3,000	$4,500	$500	$5,000
	$650	$450	$400	$3,000	$4,500	$500	$5,000

Exhibit 82.

c. A statement showing a comparison of salesman performance, including the net sales, total cost of goods sold, and the profit or loss from each salesman's activities (Exhibit 82).

d. A comparative territorial profit and loss statement (Exhibit 83).

e. A comparative product profit and loss statement (Exhibit 84).

EXHIBIT 83
THE CONSOLIDATED MANUFACTURING CO.
COMPARATIVE TERRITORIAL PROFIT AND LOSS STATEMENT
Jan. 1 to Jan. 31, 19—

	Ohio	Indiana	Illinois	Total
Gross sales	$20,000	$18,000	$30,000	$68,000
Less: sales returns and allowances	2,200	2,000	3,000	7,200
Net sales	$17,800	$16,000	$27,000	$60,800
Manufacturing cost of goods sold	$10,000	$15,000	$20,000	$45,000
Selling expense	1,700	1,680	2,620	6,000
Administrative expense	1,250	900	1,850	4,000
Total cost to make and sell	$12,950	$17,580	$24,470	$55,000
Net profit or loss	$ 4,850	$ *1,580**	$ 2,530	$ 5,800

* Loss.

EXHIBIT 84
THE CONSOLIDATED MANUFACTURING CO.
COMPARATIVE PRODUCT PROFIT AND LOSS STATEMENT
Jan. 1 to Jan. 31, 19—

	Product A	Product B	Product C	Total
Gross sales	$29,000	$18,000	$21,000	$68,000
Less: sales returns and allowances	2,200	2,000	3,000	7,200
Net sales	$26,800	$16,000	$18,000	$60,800
Manufacturing cost of goods sold	$16,000	$14,000	$15,000	$45,000
Selling expense	3,000	1,200	1,800	6,000
Administrative expense	2,100	900	1,000	4,000
Total cost to make and sell	$21,100	$16,100	$17,800	$55,000
Net profit or loss	$ 5,700	$ *100**	$ 200	$ 5,800

* Loss

Questions

1. Distinguish between manufacturing and distribution costs. Give two costs that are strictly manufacturing, two that are strictly distribution, and two "borderline" costs.

2. Why is there an increasing need for control of distribution costs? Mention four products for which marketing costs require a larger proportion of the total cost to make and sell than manufacturing costs.

3. What is the Robinson-Patman Act? Why is it important to the distributor of merchandise?

4. Outline a general plan of accounting for distribution costs for an enterprise selling its products through the media of its own salesmen and territories. How would the plan be changed in case it was considered desirable to account also for sales service departments?

5. What basis would you recommend for the distribution of each of following selling expenses to sales departments and to territories:

a. Newspaper advertising?
b. National radio advertising?
c. Catalogues?
d. Selling salaries?
e. Traveling expenses?
f. Shipping expenses?
g. Rent?
h. Property insurance?

6. Describe the procedure involved in the transfer of selling expenses to sales departments and to territories and, finally, in the transfer of sales departments expenses to territories.

7. What base or bases would you consider the most equitable for the distribution to territories of the following sales departments selling expenses:

a. Advertising department?
b. General sales department?
c. Dealer and jobber service?
d. Adjustment department?
e. Shipping department?
f. Sales accounting department?

8. What journal entries are required at the end of the accounting period to transfer total selling expenses to sales service departments, to territories, to territorial profit and loss accounts, and, finally, to the general profit and loss account?

9. What difficulties are encountered in the classification of distribution costs by salesmen? By customers?

10. Is an analysis of distribution costs by sales orders a practical costing procedure for the majority of companies? Of what significance is such an analysis?

11. What are territorial distribution rates for selling expense? How are they computed? How are they employed in applying selling expenses to sales orders?

12. Name four methods that can be used in computing territorial selling expense distribution rates. Which methods are considered to be the most equitable?

13. Describe the procedure of determining distribution costs and profit or loss by lines of products. What difficulties and limitations are encountered in obtaining accurate cost figures for lines or classes of products?

14. What types of monthly statements can be prepared to inform management of distribution costs and profit or loss conditions for territories, salesmen, and products?

Problem 1

The Bell Laboratories manufactures and sells a line of cosmetics to drug and department stores through its own salesmen in four territories which are coded 1, 2, 3, and 4.

The following information is available for the month of January:

	Territory 1	Territory 2	Territory 3	Territory 4	Total
Sales	$45,000	$17,000	$30,500	$26,000	$118,500
Sales returns	2,000	1,000	500	3,000	6,500
Supplies expense	200	150	225	100	675
Salesmen's salaries	4,000	1,500	2,200	2,000	9,700
Salesmen's commissions	2,000	800	1,500	1,000	5,300
Rent of branch offices	150	100	125	100	475
Traveling expenses	600	200	350	150	1,300
Direct advertising expense	1,200	600	1,250	650	3,700
Depreciation of equipment	175	125	150	100	550
Insurance and taxes	80	50	75	60	265
Telephone and telegraph	70	25	35	30	160
Delivery expenses	325	150	250	210	935

Other selling expenses which cannot be directly charged to territories are as follows: executive salaries, $1,200; general advertising, $2,000; sales office expenses, $800; traveling expenses of executives, $100; and rent of sales office, $200. Indirect selling expenses are to be apportioned to territories on the basis of net sales. The manufacturing cost of cosmetics sold is 50% of the selling price. It may be assumed that all expenses incurred are vouchered and paid.

Required:

a. Journal entries to record all transactions for January.

b. General ledger accounts.

c. A comparative statement of selling expenses for sales territories and a comparative territorial profit and loss statement.

Problem 2

The Southwestern Hardware Co. sells hardware to retail concerns through its own salesmen. The company has four sales territories coded as 1, 2, 3, and 4; and five sales service departments: general sales office, advertising, shipping, warehouse, and credit.

The selling expenses for July are as follows:

Salesmen's salaries	$1,800
Salesmen's commissions	600
Office and executive salaries	1,850
Dues and subscriptions	50
Advertising	2,000
Traveling expenses	260
Supplies	420
Depreciation of building	200
Depreciation of sales equipment	170
Property taxes on building	100
Fire insurance on building	20
Fire and theft insurance on sales equipment	30
Light, water, and heat expense	80
Miscellaneous sales expenses	420
Total selling expenses	$8,000

Sales departments	Net sales	Salesmen's salaries	Salesmen's commissions	Office and executive salaries	Supplies expense	Traveling expenses	Cost of sales equipment	Building space, square feet	Survey percentages	
									Shipping, per cent	Warehouse, per cent
General sales office				$ 600	$ 40	$175	$ 800	800		
Advertising				400	60	25	600	600		
Shipping				250	120		1,000	2,400		
Warehouse				300	110		2,400	12,000		
Credit				300	20	60	200	200		
Territory 1	$13,000	$ 600	$200		25		2,400		30	33
Territory 2	10,000	400	175		15		1,200		25	27
Territory 3	6,500	375	100		10		800		15	12
Territory 4	10,500	425	125		20		1,600		30	28
Total	$40,000	$1,800	$600	$1,850	$420	$260	$11,000	16,000	100	100

The average gross profit is 35 per cent on net sales.

It may be assumed that all selling expenses, with the exception of depreciation and property taxes, are vouchered and paid during the month. Dues and subscriptions and miscellaneous sales expenses are transferred directly to the General Sales Office account when the books are closed. The advertising expenditure for the month is apportioned to territories on the basis of net sales. Yearly depreciation of sales equipment is computed as 12 % of the cost of equipment used in sales offices and 24 % of the cost of equipment used in territories. Property taxes, fire insurance on buildings, light, water, and heat expense are charged to sales departments on the basis of floor space; fire and theft insurance on sales equipment is charged to sales departments and territories on the basis of the cost of equipment used by each sales unit. The average gross profit is 35 % on net sales.

The schedule on page 375 shows additional information concerning sales departments and territories for July.

The total general sales office expenses, advertising department expenses, and credit department expenses are apportioned among territories on the basis of net sales. A survey was made of the services rendered territories by the shipping and warehouse departments; percentages for the allocation of each of these departments' expenses are given in the schedule.

a. Prepare journal entries to record all transactions for July.

b. Submit general ledger accounts.

c. Prepare a comparative statement of selling expenses for sales departments; a comparative statement of selling expenses for sales territories; and a comparative territorial profit and loss statement.

Problem 3

The Mid-West Office Supply Co. sells office supplies to retail concerns through its own sales staff consisting of five salesmen. The company accumulates costs and obtains a general profit and loss analysis monthly. The company requests you to make a study of its distribution costs for the month of June and to prepare a statement showing a comparison of salesman performance, including the net sales, total cost of goods sold, the profit or loss from each salesman's activities, and totals for all salesmen.

From the company records you are able to secure the following information concerning costs and sales for the month of June:

	Smith	Jones	Brown	Skinner	Peck	Total
Sales	$2,200	$2,500	$1,800	$3,000	$1,500	$11,000
Sales returns and adjustments	100	50		200		350
Salaries	150	175	150	175	150	800
Commissions	42	49	36	56	30	213
Traveling expenses	75	80	60	90	70	375
Depreciation of automobile	20	22	18	22	18	100
Insurance and taxes	5	6	5	6	5	27
Cost of goods sold	1,500	1,600	1,200	1,900	1,050	7,250
Freight-out	68	80	61	101	57	367

General advertising, $200; salary of sales manager, $300; sales office expenses, $600. Sales office expenses are to be apportioned to salesmen equally; general advertising and salary of sales manager are to be allocated to salesmen on the basis of net sales.

	Advertising department	Warehouse	Credit department	Delivery department	General sales office	Territory 1		Territory 2		Territory 3
						Roberts	Heck	Johnson	Thomas	Shannon
Net sales						$4,000	$3,500	$2,800	$3,600	$4,200
Cost of goods sold						3,200	2,800	2,300	2,900	3,600
Salaries	$250	$175	$225	$200	$400	150	125	125	125	150
Commissions						80	70	56	72	84
Traveling expenses	10		25		30	75	60	50	65	85
Rent of building	25	100	10	25	40					
Advertising						35	25	20	25	45
Repairs		20			10					
Telephone and telegraph	3	6	6	3	15	10	15	5	6	9
Depreciation	5	15	5	30	10					
Taxes and insurance	3	20	3	15	5					
Supplies	15	20	5	25	10	5	8	2	5	10
Heat and light	8	24	3	10	9					
Number of customers						50	40	35	55	80
Number of orders						75	80	65	85	95
Mileage traveled						1,500	2,000	1,200	1,400	2,000
Number of calls						100	120	115	110	125

Problem 4

The Waldon Drug Supply Co. serves approximately 400 retail drugstores in its three trade territories through its five salesmen. The company does not desire to include detailed distribution cost information in its regular accounting records but requests you to make an analysis of distribution costs and of profit or loss for territories and salesmen for October, which is considered representative as a typical month.

Your investigation of the company business for October discloses the following information:

Sales service departments: advertising, warehouse, credit, delivery, and general sales office.

Territories and salesmen: Roberts and Heck in territory 1; Johnson and Thomas in territory 2; and Shannon in territory 3.

Analysis of sales, expenses, and salesmen's activities for October are shown in the table on page 377.

You are requested to submit for October the comparative statements which you consider necessary to provide the management with complete information concerning distribution costs and profit or loss for distribution units. (Indicate bases used in apportioning costs.)

Problem 5

The Oakland Mercantile Co. distributes three lines of canned and bottled goods to groceries, restaurants, and hotels. The three price and quality lines of products may be designated as A, B, and C. The company does not maintain a territorial classification of sales and selling expenses but does account for these elements and computes profit or loss by lines of products.

The schedule below shows data which have been directly identified with lines of products for the month of January:

	Line of products A	Line of products B	Line of products C	Total
Sales	$20,000	$45,000	$32,000	$97,000
Sales returns and allowances	1,000	3,000	2,000	6,000
Sales discounts	200	400	500	1,100
Direct advertising	500	1,200	400	2,100
Salesmen's salaries	200	500	250	950
Salesmen's commissions	100	400	60	560
Warehouse expense	150	225	175	550
Shipping expense	175	200	240	615
Freight-out	250	475	350	1,075
Estimated gross profit on net sales, per cent	40%	33⅓%	25%	

Sales discounts are considered a reduction in sales in determining net sales. Other selling expense which cannot be directly identified with lines of products include: general advertising, $1,500; general sales salaries, $1,200; sales office expenses, $800. These general selling expenses are apportioned to lines of products on the basis of the gross profit on net sales as follows: A, 40%; B, 33⅓%; and C, 25%. It may be assumed that all expenses are vouchered and paid.

a. Prepare journal entries to record all transactions for January.

b. Submit general ledger accounts.

c. Submit a comparative profit and loss statement for lines of products and a comparative statement of selling expenses for lines of products.

Problem 6

The Farmers Elevator sells twine, coal, and repair parts supplementary to buying and selling wheat. In order to determine the profit or loss for each operation, the system of accounting is based on lines of products.

The following is a trial balance for the period July 1, 19—, to June 30, 19—.

Accounts	Dr.	Cr.
Interest	$ 90.00	
Cash	565.40	
Accounts receivable	145.90	
Notes payable		$ 1,500.00
Capital stock		10,000.00
Surplus		1,089.51
Elevator building	16,000.00	
Coal shed	120.00	
Repair-parts room	220.00	
Reserve for depreciation—elevator building		1,600.00
Reserve for depreciation—coal shed		12.00
Reserve for depreciation—repair-parts room		22.00
Purchases:		
Wheat	101,473.21	
Twine	754.00	
Coal	805.00	
Repair parts	654.50	
Sales:		
Wheat		107,011.00
Twine		1,042.10
Coal		1,201.50
Repair parts		745.40
Beginning inventory:		
Wheat	0.00	
Twine	710.50	
Coal	10.00	
Repair parts	420.50	
Salary—manager	1,500.00	
Extra help	190.00	
Utility expense	75.50	
Repairs expense	27.00	
Prepaid insurance	270.20	
Miscellaneous expenses	35.90	
Taxes	114.50	
Office supplies expense	21.20	
Janitor supplies expense	20.20	
	$124,223.51	$124,223.51

Ending inventory:

Wheat	0.00
Twine	840.90
Coal	20.00
Repair parts	510.10

Estimated life of building is 20 years; 2 % of elevator building is used as a storeroom for twine.

All extra help should be charged to wheat since it was required during the harvest season.

Seventy per cent of taxes and insurance is on buildings and 30 % on contents. Distribute the 70 % on same basis as depreciation. Use purchases rather than inventory for the 30 % since at end of the fiscal year both coal and wheat inventories are exceedingly low.

Interest expense is considered to be a nonoperating expense.

Distribute all other expenses on the basis of gross profit. Gross profit should be used instead of sales because the turnover is greater and markup is much smaller for wheat than for the other products.

Insurance expense is $225.

Present a comparative profit and loss statement for the Farmers Elevator for the year.

Problem 7

Prepare a schedule showing sales, costs, and operating net income for each line of goods distributed by the Argo Grocery Co. Furnish supporting schedules indicating clearly how the items of expense have been apportioned. Show results only to the nearest dollar.

The Argo Grocery Co. manufactures and distributes in a limited area two lines of grocery products. One line is distributed to hotels and restaurants, the other to retail grocers. Selling organizations for the two lines are separately set up and operated, and there is considerable rivalry between them. There is also a good deal of argument about which line nets the greater income to the company. Total dollar volumes of the two lines are roughly equal, but on account of competitive conditions the margins in the restaurant line are relatively narrow, whereas wider margins are enjoyed by the retail line. From this fact the sales manager for the retail line argues that his line contributes more to the company's net income. The restaurant sales manager, however, insists that the distribution costs per dollar of sales for his line are sufficiently lower to make up for the difference in margin.

In an attempt to settle the argument the following facts about the company's 1940 business have been ascertained:

Both lines are stored in a single warehouse, and packing and shipping activities are carried on by the same crew. The restaurant line consists of 10 items and is sold in shipping containers supplied by the factory and included as part of factory cost. The retail line consists of 50 items. The goods must be assembled and packed in containers after orders are received. Time studies indicate that it takes about four times as long to prepare $100 worth (at selling price) of retail goods for shipment as in the case of restaurant goods. Restaurant goods are delivered at the warehouse dock to customers' trucks or to common carriers; in the latter case the customers pay the freight. The company's own delivery equipment is used entirely for the retail line.

Advertising is directed entirely at the ultimate consumer, with the aim of persuading him to demand the company's products at stores and in public eating places.

It consists of newspaper advertising and of display matter and leaflets supplied to dealers. About 10% as much newspaper space is devoted to the restaurant line as to the retail line. The company's advertising staff consists of one man, who spends two-thirds of his time on newspaper advertising and the balance on display and leaflet material.

Schedule 1 lists the operating expenses of the company other than those concerned with manufacturing. Schedule 2 lists important operating data ascertained in the course of your investigation. The apportionment of office and clerical time is the result of time studies and estimates. It is the opinion of the management that office supplies and equipment expense roughly parallels the office and clerical salaries.

SCHEDULE 1
EXPENSE DATA

Sales force salaries and expense:	
Restaurant line	$15,000
Retail line	35,000
Warehouse depreciation, insurance, etc.	4,000
Packing and shipping wages	10,000
Shipping containers	800
Other shipping supplies (proportionate to number of sales invoices)	600
Delivery wages, supplies, and expense	3,000
Newspaper advertising	11,000
Display material and dealers' helps	2,500
Advertising salary	1,650
Office and clerical salaries (see Schedule 2)	5,000
Office supplies and equipment expense	1,600
Executive salaries and expense (apportion on basis of sales)	8,000
Bad debts allowance	1,590
Total	$99,740

SCHEDULE 2
OPERATING DATA

	Restaurant	Retail
Sales	$240,000	$270,000
Factory cost of sales	$200,000	$180,000
Warehouse space occupied by $100 worth, at cost	30 cu. ft.	60 cu. ft.
Average inventory, at cost	$ 20,000	$ 40,000
Number of sales invoices	1,000	9,000
Average number of items per invoice	4	12
Number of customers	28	224
Average customers' accounts outstanding	$ 20,000	$ 40,000
Analysis of office and clerical time:		%
Keeping warehouse stock records		5
Preparing order and sales invoice forms		25
Posting sales invoices		15
Receiving cash and posting cash receipts		5
Preparing customers' statements		5
Credit and collection activities		10
General accounting and clerical (apportion on basis of sales)		35
		100

The management rejects as inadmissible the inclusion of interest on investment. Approximately one-half of the time of credit and collection employees is spent in routine checking orders for credit approval. The balance is spent on credit follow-ups and attempts to collect specific accounts. Experience indicates that the average retail account is about five times as likely to require such collection effort as the average restaurant account. Historical records show that about ½ of 1 % of retail sales are never collected, whereas only 1/10 of 1 per cent of restaurant sales proves to be uncollectible.

Ninety per cent of the job of keeping warehouse stock records is concerned with shipments and 10 % with receipts from the factory. All items of the restaurant line are received at the warehouse every day, but items in the retail line are received on the average only every other day.

(American Institute of Accountants, November, 1941, Part I, No. 3)

CHAPTER XIX

STANDARDS FOR DISTRIBUTION COSTS

It may seem difficult, in the present stage of development of managerial and cost accounting technique, to develop a system of standard costs in the distribution and administrative divisions which will compare with the minute systems in use in manufacturing divisions. Executives do not question the need for standards as a means of controlling distribution and administrative costs, but they recognize the difficulties encountered in controlling these costs. In fact, if it were a question of choosing between the introduction of a standard cost system in the manufacturing division and in the sales division, the latter would probably be selected. The sales division of enterprises which distribute their own products is generally the most difficult of the three divisions to control. In factories the activities of men and machines can be closely related, and their work can be carefully timed so as to prevent wide variations from efficient production. Piece-rates for all classes of direct workers and inspections of completed work at each stage of production can be provided as a means of increasing efficiency, and standards can be used effectively as a supplementary aid to these two managerial devices.

In the distribution divisions management does not have so effective means of control as exist in the manufacturing departments. There appears to exist a type of freedom, fewer restrictions, and less check on the hourly and daily activities of office workers, salesmen, and executives. Accompanying the lack of minute control, waste, extravagance, and uneconomical use of equipment and of employees' time tend to develop, and unnecessary expenses are incurred. Consequently the development of cost standards in the distribution divisions seems highly desirable.

Standards for use in nonmanufacturing divisions become both possible and practical when a complete system of budgetary control is in use. The term "standard" in its full meaning goes beyond the "standard cost" concept as originally applied to manufacturing costs. The principles underlying the development of standards can be applied to all functions of the business enterprise and can be made to include many activities in the selling divisions.

Standard distribution costs can be so prepared that a standard cost analysis can be made of each distribution cost unit, including sales territories, salesmen, lines of products, and in some cases sales orders and jobbers. Since selling costs vary in each sales territory, there can be

standards established that permit the preparation of a separate profit and loss statement for each territory in advance of the accounting period. The standards set from the budget estimates must be reasonable and possible of attainment. Since many of the standards are not permanent, new standards may be necessary for each budget period to meet the changing internal and external business conditions. The important objectives should not become obscure. Standards should be determined in such a way that they express with a reasonable degree of accuracy the amount of each sales dollar that *should* be attributable to manufacturing costs, distribution costs, and administrative costs.

Standards Vary in Extent and Completeness.—Almost every sales organization has some form of standards in use, but the extent to which standards can be applied to various phases of an organization depends upon the type of enterprise and the degree to which standardized practices have been adopted. In the majority of cases the standards are not incorporated in the accounting records; they are used simply as a means of checking the operating efficiency of individuals or of groups within the sales organization. For example, one concern may limit its use of standards to the determination of a sales quota for each salesman and an advertising appropriation for each product for each sales territory; a second concern may prepare elaborate schedules of standards which apply to every type of selling expense, to every sales department and territory, to each salesman, and to each product or line of products.

The channels of distribution of the product may be an important determinant in the extent to which standards are used. Enterprises which sell their entire output to a few jobbers, to chain organizations, or to manufacturing concerns are less likely to require standards as a means of measuring the efficiency with which the distribution functions are performed than are enterprises which perform all the functions of marketing their products either directly to consumers through their own salesmen or through retailers. The more complex the sales organization, the greater is the need for standards as a means of managerial control.

Setting Standards for Sales.—The determination of a standard sales volume is the starting point in the establishment of standards for distribution costs, because the standard sales volume is the basis for the computation of selling expenses required to market the quantity of products set as the goal. The sales budget establishes the standard sales for the period. Past, present, and forecasted future conditions within the business organization, in the industry, and in new and old trade territories must be considered. The estimated sales as shown in the sales budget may be the standard volume; or the incorporation of standard cost procedure may result in the sales estimates being increased over anticipated amounts for some territories, salesmen, or products.

The standard sales budget should show estimates of the expected sales for the period, generally 6 months to 1 year in length, for classes of products for each territory or branch, for each salesman, and in some cases for each customer. After the standard sales volume is determined for each sales unit, a definite basis has been established for the derivation of expense standards for each sales unit of the distribution process.

Sales Quotas.—The most common form of standard for territories or branches and salesmen is the sales quota. The sales quota is a standard by which management can measure actual accomplishments of the sales personnel in comparison with sales possibilities. It is a form of standard which, when scientifically determined, is a stimulus to salesmen and to sales executives. Sales quotas serve the same purpose for the sales division that piece-rates and scientific wage systems contribute to the factory.

Various forms of sales quotas are in use. They may be expressed in terms of quantities of products, in dollars, or in points, each point representing a sum such as $25 worth of merchandise. They may apply to the sum of all products, or they may be determined for individual products. If the quotas are to be effective standards, they must be both reasonable and possible of attainment. After quotas have been set, they should be changed only when there are important changes in conditions which invalidate them.

Setting Standard Budgets for Selling Expenses.—The procedure for determining standard budgets for selling expenses is similar in plan to that used for standard expense budgets in the manufacturing division. It involves building a budget of standard selling expenses by type, the allocation of the standard selling expenses to sales service departments and sales territories, the reapportionment of standard expenses for the sales service departments to sales territories, and the selection of a functional unit or units to measure the activities of each department and territory.

Standard selling expense budgets should be so prepared that they show a classification of expenses as to fixed and variable charges. The fixed expenses, which include such items as depreciation, taxes, insurance, and rent of sales offices, may be carefully inspected to see that they have been properly computed. Since they are fixed in amount, regardless of increases or decreases in sales volume, they constitute standards for the budget period.

It is in the case of variable selling expenses that the determination of standards has the greatest value. Variable expenses include various types of advertising; selling salaries, commissions, and bonuses; traveling expenses; telephone and telegraph charges; postage and supplies; losses on bad debts; repairs to cars and trucks; and shipping and delivery costs. These expenses, assignable to sales service departments, sales territories,

and in some cases to salesmen and customers' accounts, are subjected to a rigid examination, and a standard in terms of a functional unit or units may be determined for each department, territory, product, salesman, or account.

Sliding-scale Budgets.—In many business enterprises it is difficult to forecast accurately the sales volume for 6 months or 1 year in advance. Aware of this difficulty, some executives contend that it is futile to attempt to set sales quotas and to determine standards for selling expenses. Others advocate the use of standards in connection with sliding-scale budgets which are employed in the distribution division of the business enterprise in a manner similar to those used in the manufacturing division.

The plan is to set two or more levels of sales volume. For example, $100,000 may be forecasted as the highest possible sales volume that could be obtained by the sales division and $60,000 may be set as the lowest possible limit; between the two extremes one or more levels of sales volume may be determined. The problem is to prepare standard selling expense budgets which contain detailed estimates of selling expense for sales service departments, territories, and perhaps salesmen, for each level of sales volume. If a territory achieves the maximum sales quota assigned to it, the standard selling expense budget applicable to the first level of sales volume would be applied; if the sales for the territory are in the lowest level of sales volumes, then the territory is expected to keep its selling expenses within the limits set in the standard selling expense budget for that level of sales activity. The same plan is followed in matching the standard selling expenses against intermediate levels of sales volumes.

Determining Unit Standards for Distribution Costs.—The distribution functions of the majority of business enterprises are more varied and less uniform than are those of manufacturing divisions. Therefore unit standards for various types of sales activities cannot be determined so accurately as manufacturing cost standards, nor can they be so completely applied. No units of measuring activities can be found for some types of selling expenses, while in other cases the functional units selected are not entirely satisfactory; as a result the standards are not always effective measurements of distribution efficiency. It is a common practice to determine standards for those selling expenses and sales divisions which perform functions that can be easily standardized and to eliminate from standardization those in which there is little or no uniformity in activities. Particular expenses of divisions in the latter classification may be subjected to special investigation on occasions, but the derivation of standard unit costs is not a regular practice.

A recent publication of the U.S. Department of Commerce entitled "Distribution Cost Accounting for Wholesaling" gives the following

list of functions and their corresponding service units which have been used in actual analyses of distribution costs[1]:

Function	Service Unit
Assembling and checking orders.	The order or the invoice line or the volume unit.
Carrying (financing).	The dollar of inventory.
Cash receiving.	The customer month.
City delivery.	The truck mile or hour or the order or invoice line or the unit of goods sold for city delivery.
Credit and collection.	The customer.
Dealers' helps.	The customer.
Delivery of country shipments to station.	The merchandise unit.
Direct mail advertising.	The mail solicitation.
Filling orders.	The invoice line.
Getting out stock for orders.	The invoice line.
Handling.	The invoice line.
Haulage (receiving and shipping truckage).	The hundredweight.
Keeping stock records.	The invoice line.
Maintaining order and letter files.	The order or letter.
Merchandise storage.	The square foot or cubic foot of storage space provided or used.
Packing and loading.	The merchandise unit or the order or the volume unit.
Posting invoices to customers' accounts.	The order.
Preparation and mailing of customers' statements.	The customer.
Preparation of invoices and shipping documents (except pricing and extending).	The order.
Pricing and extending invoices.	The invoice line.
Receiving and posting cash receipts.	The individual cash collection.
Receiving stock.	The volume unit.
Sales analyses and statistics.	The invoice line or the order.
Salesmen's compensation.	The call.
Salesmen's equipment.	The call.
Salesmen's telephoning.	The call.
Salesmen's travel.	The day or mile traveled.
Stenciling or labeling orders.	The order.
Traffic and claims.	The order.
Transportation of country shipments (freight, express, postage).	The thousandweight-mile.

[1] TAGGART, H. F., "Distribution Cost Accounting for Wholesaling," pp. 10–13, U.S. Department of Commerce, Washington.

In discussing the utility of the functional analysis, budgets, and standards, the bulletin explains:

At this stage or level of analysis the emphasis is still on the users of cost accounting for the internal control of operations. Many of the functions and units above listed are useful also in translating functional costs into departmental or territorial or other types of cost, but their primary utility is for the management in conducting the internal affairs of the organization in an intelligent and efficient way. The principal way in which these functional analyses are useful for this purpose lies in their employment for the preparation and administration of standards and budgets.

Planning of sales activities can best be done in terms of the operations to be performed—the telephone and personal calls to be made by salesmen, the number of mail solicitations, the orders to be received, recorded, filled, packed, loaded, and delivered, the invoice lines to be written, priced, and extended, and so forth and so on through all the processes required in acquiring and disposing of the goods which it is intended to sell. On the basis of experience and the analysis of operating functions a standard cost for each operation can be determined. This standard does not merely reflect what the cost has been in the past but what it ought to be in view of expected wage rates, labor efficiency, and other circumstances.

The budget is made up in terms of the expected number of operations of every type involved in expected sales, and the standard unit costs of these operations. Then as actual sales, operations, and cost appear, actual costs can be compared with budgeted costs in such a way as to show how much of the difference can be accounted for by increased or decreased requirements for services and how much is chargeable to increase or decrease in unit costs. It is the latter cause of difference, of course, which requires the attention of management.

For example, suppose that the standard cost per item or invoice line for getting out stock for orders is 1.5 cents. If selling plans for the coming month call for 100,000 item sales, the total budgeted cost for this activity is $1,500. On this basis the financial plans for the month are prepared. Actual item sales, let it be assumed, total 110,000, and the actual cost of getting out stock is $1,600. The increase in cost is only 6⅔ per cent, with an increase in activity of 10 per cent. On a standard cost basis the cost would have been $1,650. Evidently $50 has been saved through improved efficiency in carrying out the function. If, on the other hand, item sales had been 90,000, and actual cost had been $1,450, a failure to attain expected efficiency would have been evident, with resulting "loss" of $100 (derived by subtracting the standard cost of the actual units of service, $1,350, from the actual expenditure).

In order that this device may attain the maximum usefulness the functions and units of service must be most carefully chosen. The functions must be really homogeneous, and the units must be significant measures of the variability of their costs. Fixed items, such as supervision and space costs, must be separately dealt with. This does not mean, of course, that functions and units can be so devised that the cost can be expected to vary completely and perfectly with the difference in the number of service units, and it may be in some cases that the

only solution will be "sliding scale" unit cost standards—that is, standard costs which are adjustable to changes in volume. In some cases the budget must presumably be fixed, since such costs as top supervision and the costs of furnishing space do not vary within wide limits of increased or decreased business activity. The conditions in each case will indicate to what extent the procedure must be varied in order to obtain the greatest possible benefit.

A discussion of unit standards for distribution costs is necessarily incomplete unless it is applied to a particular business enterprise which has its own peculiar problems, so only a general description of the preparation of standards for selling expenses is given in the sections which follow.

Advertising Expenses.—A complete analysis of the advertising program for the budget period in terms of estimated sales should result in setting a standard advertising expense appropriation for each type of advertising for each sales territory, each unit, and in some cases for each dealer or customer's account.

Newspaper and magazine advertising plans can be reduced to the amount of space used and the publication rate for each periodical. Generally the appropriation is determined as a percentage of the expected sales of the concern. The standard appropriation for newspaper advertising may be supported by a schedule showing the amount allotted to each periodical in each territory for each month or season.

In a similar manner, appropriations which will constitute the standard allowance for the period are specified for radio and billboard advertising. A percentage of estimated sales may be determined for each form of advertising, after which the separate appropriations can be further subdivided into separate allotments for each territory.

The standard appropriation for dealers' helps, which include placards and display material, demonstrations, and window and store arrangement service, is determined after a study has set the amount of service each dealer is to receive and its cost has been estimated. The cost per dealer multiplied by the number of dealers equals the standard allowance for dealer help for the period.

The standard cost for catalogues is determined by computing the cost per catalogue and by multiplying this amount by the number of catalogues to be distributed to dealers or to customers in each territory. The number of active and prospective dealers and customers is estimated from a careful analysis of conditions in each territory.

Selling Salaries.—In determining a standard allowance for selling salaries for the budget period, the management of a business enterprise will subject the entire sales organization to a rigid examination. The work done by each employee in each sales department and sales territory is examined, and a contraction or expansion in sales personnel is planned in order to launch successfully the sales program set up in the standard

sales budget. The result of the survey is the preparation of a schedule showing the personnel requirements, classified by positions, and the standard salary allowance for each class for each sales department and territory. It is expected that the standard selling salaries budget will be followed explicitly during the period, unless there is a change in the sales program.

Sales Commissions and Bonuses.—Sales commissions and bonuses are set as a percentage of sales or as an amount per unit of product. A standard schedule of commissions and bonuses should be prepared in advance of the budget period, and should be applied to all salesmen consistently and uniformly throughout the period. The amount offered as an incentive to salesmen and sales executives is the result of executive decision, after consideration of such factors as the selling price of products, competitive conditions, salaries paid to salesmen, stage of territorial development, and the experience and training of salesmen.

Traveling Expenses.—Even if business enterprises do not develop standards for all types of selling expenses, generally they employ standard allowances for traveling expenses. A manual or regulation sheet is prepared to show standard expense allowances for each item of traveling expense. A standard rate per mile is set for all travelers; state or national mileage charts are used to check distances between cities; and per diem rates are set for meals and lodging. Sometimes maximums are set for each type of traveling expense. The regulations also cover such items as gratuities, repairs to cars, entertainment expenses, and emergency purchases of supplies.

In preparing the standard budget for traveling expenses, it is necessary to study each territory and to estimate the number of miles each salesman and supervisor will travel to accomplish his sales quota. This may be a general survey, or it may be made in such detail as to include a schedule of each salesman's route in miles and the number of calls to be made each day. The number of salesmen days and miles multiplied by the standard travel allowances for each type of expense provides the total standard budget appropriation for traveling expenses.

Supplies.—A standard allowance for supplies for each sales office, sales territory, and salesman is frequently difficult to determine, but a knowledge of amounts used during past periods and of the requirements for each sales unit makes possible the setting of standards for this variable selling expense. Such sales departments as advertising, sales promotion, general sales, credit, collection, shipping, and sales correspondence can be requested to prepare a list of the supplies to be required during the period. This list can be carefully scrutinized in terms of the functions performed and the sales work to be accomplished, and a standard budget allowance can be set for each department.

The supply requirements for each territory and each salesman can be estimated rather accurately. In some cases samples, display materials, and catalogues can be listed in terms of salesmen; each territory may have supply needs that can be accurately estimated; and estimates of stationery, stamps, and other forms of supplies can be prepared for both groups. Thus a standard allowance can be made for each type of supply for each sales unit. Generally this results in more effective and more economical use of supplies.

Telephone and Telegraph Charges.—Unless some control is exercised over the sales personnel, extravagance tends to exist in incurring telephone and telegraph expenses. Many enterprises require that a form be prepared for each call and telegram to show the purpose and importance of the message, and such a practice aids in discouraging unnecessary incurrence of such expenses. Past experience and a knowledge of conditions within each sales department and territory should make possible the preparation of standard allowances for telephone and telegraph charges for each sales unit.

Receiving, Shipping, Delivery, and Warehouse Expenses.—These expenses are as difficult to standardize as are any in the group of variable selling expenses because, if these functions are performed by a single department, conditions of joint costs exist. If the functions and costs can be separated, it is possible to determine a standard cost for each unit of service performed. The following schedule of receiving, shipping, delivery, and warehouse expenses suggests possible unit standards which can be computed:

Expense Classification	Standard Unit of Measurement
Receiving expenses	Cost per piece, per pound, or per shipment
Warehouse expenses	Cost per cubic foot
Packing expenses	Cost per piece, per order, or per pound packed
Loading expenses	Cost per piece or per hundred pounds
Delivery expenses	Cost per mile or per ton-mile of deliveries

A detailed study should be made of the above expenses in order to determine whether or not they represent efficient operation; an analysis of the work performed in terms of units of measurement permits the setting of standard costs for each unit of work done. The standard cost per unit for each service can be used as a means of measuring the efficiency of the department or departments performing the service during the budget period.

Need for Standards for Sales Territories.—In devising a standard cost accounting system for a concern for its three divisions of manufacturing, selling, and administration so that it will be possible to charge

a standard amount of selling cost, representing sales activities, to each dollar of sales or to each unit of the product sold, it is necessary to determine a distribution rate per dollar of sales or per unit of the product for each territory.[1] The use of standard selling expense rates enables management to control selling policies and methods and to know the standard amount of selling expense incurred on each sales order for each territory from day to day. Thus if the enterprise maintains a complete standard cost system, the management may know immediately after the sale of an order in a particular territory the standard cost of manufacturing, the amount of standard selling and administrative costs applied to the order, the total standard cost to make and sell, and the net profit on the order, computed on the basis of standard costs.

In some companies where orders involve large amounts, such an analysis would prove valuable for every order sold for each territory. In other concerns it is more practical to compute these standard costs and profit elements only on the large orders and to make tests by computing the costs on every tenth small order in each territory.

To provide for the daily computation of standard costs on orders to be shipped into each territory, the amount of selling expense must be applied to each order by means of standard distribution rates. In order to arrive at a satisfactory basis for determining the amount of selling expenses that should be applied to an order:

a. A budget must be prepared for each territory, showing the total standard selling expenses.

b. The standard sales for each territory must be determined.

c. Rates for distributing selling expenses must be computed for each territory.

d. The accounting treatment to record the amount of standard selling expenses applicable to particular orders must be considered.

Standards for Sales Territories.—After a standard budget has been prepared to exhibit the estimate of selling expenses for the budget period, the standard selling expenses can be reclassified and apportioned so as to show the standard selling expense budget for each sales territory. Generally the standard selling expenses for each territory appear in a supporting schedule to the summary standard selling expense budget and were actually estimated as a step in the preparation of the summary budget. As each item of expense such as advertising, selling salaries, commissions and bonuses, and supplies was analyzed preparatory to the determination of the budget figure, the conditions existent in each sales territory were considered.

One basis for the computation of territorial distribution rates is standard sales. The basis of distributing selling expenses to sales orders

[1] Standard costs for manufacturing are discussed in Chaps. XVI and XVII; standard administrative costs are discussed in Chap. XX.

is obtained by dividing the total standard selling expenses for each territory by the total standard sales for that territory. For example, if the total standard selling expenses for Texas for the budget year, as shown in the territorial standing order for Texas, were $100,000 and the standard sales for Texas for the same period were $500,000, the distribution rate for Texas would be obtained by the following formula:

$$\frac{\text{Total standard selling expenses for Texas for budget period}}{\text{Total standard sales for Texas for budget period}} = \frac{\$100{,}000}{\$500{,}000}$$

= 20 per cent, the standard selling expense distribution rate for Texas.

The amount of standard selling expense distributed to each sales order and subsequently shown in the territorial standard profit and loss statement should be a normal amount. Normal rates are necessary because both selling expenses and sales for each territory may vary considerably from month to month, especially in seasonal industries. The normal period is deemed to be the concern's cycle of business activities, which is usually 1 year. The standard distribution rates should cover a normal period, preferably 12 months, since the year is usually the fiscal period for which advertising and other selling appropriations are made and since it covers a complete cycle of seasonal variations in both sales and selling expenses. The normal rate is determined by adding together the standard monthly selling expenses and dividing the total by the sum of the monthly standard sales for the territory.

ANALYSIS SHEET OF PROFIT AND LOSS ON SALES ORDERS

Territory: Texas — Standard selling expense distribution rate: 20 % of sales

Date	Sales invoice No.	Salesman	Standard manufacturing cost	Standard selling expense	Standard administrative expense	Total standard cost	Sales price	Profit or loss (based on standard costs)
Jan. 5	1061	Jones	$160	$60	$20	$240	$300	$60
			$160	$60	$20	$240	$300	$60

Exhibit 85.

The standard distribution rate may be used as each sales order is received. For example, if Jones, a salesman in the Texas territory, sends a sales order to the home office for $300 and the standard selling expense rate for Texas is 20%, the amount of $60 is added to the standard manufacturing and administrative costs; thus the computation of the standard cost to make and sell and of the profit or loss is made possible, as shown in Exhibit 85.

The use of normal standard distribution rates results in the amount of standard selling expense transferred to territorial profit and loss accounts being more or less than the actual selling expenses incurred during a given month. This condition is illustrated in Exhibit 86 for the Texas territory for a budget period of 6 months. It will be noticed that in May and June the sales reached the peak for the budget period and the standard selling expense applied was greater than the actual expense; the first 4 months it was less than the actual. If actual selling expenses conform to standards, there should be no difference between actual and applied standard expense at the end of the budget period.

Texas Territory — Budget period: 6 months

Month	Actual sales	Standard distribution rate, %	Standard selling expense applied	Actual selling expense	Monthly variance	
					Under	Over
January	$ 50,000	20	$ 10,000	$ 15,000	$ 5,000	
February	45,000	20	9,000	12,000	3,000	
March	60,000	20	12,000	16,000	4,000	
April	75,000	20	15,000	18,000	3,000	
May	110,000	20	22,000	20,000		$ 2,000
June	160,000	20	32,000	19,000		13,000
Total	$500,000		$100,000	$100,000	$15,000	$15,000

Exhibit 86.—Comparison of applied and actual selling expenses for a territory for a 6-month period.

Accounting for Standards for Sales Territories.—If standards for distribution costs are to be incorporated into the general ledger accounting system, two additional accounts, a variance account and a Standard Selling Expense account, may be used for each territory in connection with the actual distribution cost accounting system explained in Chapter XVIII and illustrated as Exhibit 72, shown on page 358.

A system of accounting for standard and actual distribution costs is shown in Exhibit 87. During the accounting period as orders are received from territories, the Standard Selling Expense account for each territory is credited and the Profit and Loss account for the territory is debited for

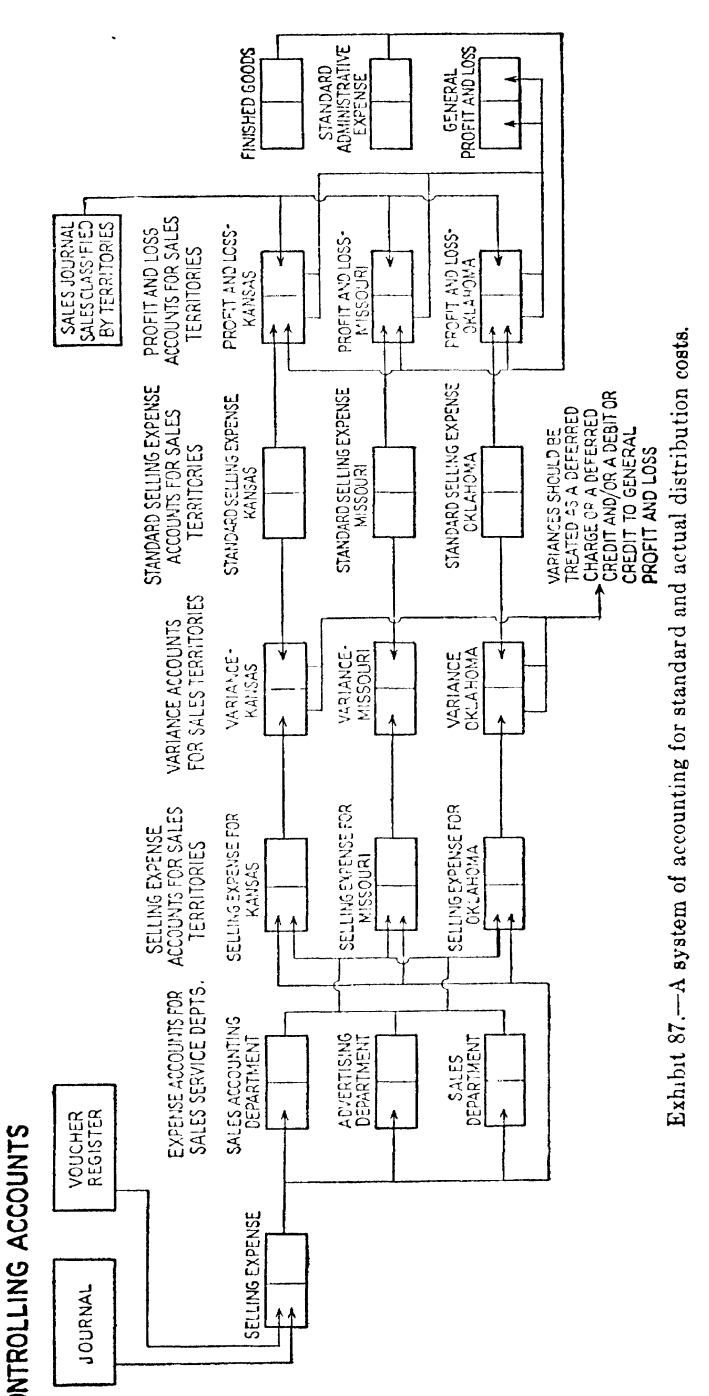


Exhibit 87.—A system of accounting for standard and actual distribution costs.

the standard amount of selling expense applied to orders. Likewise the Profit and Loss account for each territory is credited for the net sales for sales orders for the territory and is debited for standard manufacturing and administrative costs chargeable to goods sold. At the end of the accounting period, the balance of the Profit and Loss account for each territory, which represents the profit or loss computed on the basis of standard costs, is closed into the General Profit and Loss account.

Actual selling expenses incurred during the period and those expenses recognized as adjustments at the end of the period are charged first to a Selling Expense controlling account and subsequently, as a function of the closing process, are charged to selling expense accounts for sales territories. A variance account is used for each territory to show the difference between the actual selling expense account for each territory, which has a debit balance, and the standard selling expense account for each territory, which has a credit balance.

The variance account for each territory should be analyzed carefully by comparing actual selling expenses with standard selling expenses, due consideration being given to seasonal conditions of both selling expenses and sales. If the variance for a territory is found to be due entirely to seasonal factors, it should be treated as a deferred item and carried in the balance sheet, because it will be offset by counteracting seasonal conditions during subsequent months of the year. If the variance is attributable to inefficient operation or to better than standard performance, the variance should be transferred directly to the General Profit and Loss account.

Exhibit 88 is a statement showing standard selling expenses, standard sales quotas, and a standard selling expense distribution rate for each of three sales territories.

Standards for Salesmen.—The general plan of setting selling expense standards for salesmen within each territory is similar to the one used in determining standards for territories; the difference is entirely in the amount of detail included in the analysis of expenses. The preparation of standard selling expenses for salesmen is considered a subclassification of the standard selling expenses for the territory in question. In order to set standards for selling expenses for each salesman, it is necessary to analyze selling expenses such as his salary, commissions, special advertising over which he has control, traveling expenses, telephone and telegraph, and supplies; all such items are considered in their relation to the sales quota assigned to him. The analysis may involve scheduling customer or dealer calls and planning the salesman's route each working day of the period. A standard budget can be prepared for the salesman to include these direct changes, but there must be added an amount to represent indirect territorial expenses such as office rent, salaries of territorial

EXHIBIT 88

MID-WEST HARDWARE CO.

STATEMENT OF STANDARD SELLING EXPENSES, SALES QUOTAS, AND STANDARD DISTRIBUTION RATES FOR TERRITORIES

Year ending Dec. 31, 19—

Selling expenses	Standard units	Michigan			Wisconsin			Minnesota			Total		
		Units	Per unit	Amount	Units	Per unit	Amount	Units	Per unit	Amount	Units	Per unit	Amount
Variable expenses:													
Advertising—catalogues	Number of catalogues	14,000	$ 0.20	$ 2,800	8,500	$ 0.20	$ 1,700	9,500	$ 0.20	$ 1,900	32,000	$ 0.20	$ 6,400
Advertising—dealer helps	Number of dealers	200	25.00	5,000	150	25.00	3,750	175	25.00	4,375	525	25.00	13,125
Advertising—newspaper	5% of sales			7,500			5,000			5,750			18,250
Salesmen's commissions	1% of sales			1,500			1,000			1,150			3,650
Auto travel	Mileage	50,000	0.05	2,500	40,000	0.05	2,000	42,000	0.05	2,100	132,000	0.05	6,600
Meals and lodging	Per diem	1,200	4.00	4,800	900	4.00	3,600	1,000	4.00	4,000	3,100	4.00	12,400
Delivery truck operations	Miles	20,000	0.10	2,000	15,000	0.10	1,500	18,000	0.10	1,800	53,000	0.10	5,300
Shipping expenses	Number of products	2,500	1.00	2,500	1,800	1.00	1,800	2,000	1.00	2,000	6,300	1.00	6,300
Fixed expenses:													
Salaries—sales-managers	Number of employees	1	4,000	4,000	1	3,000	3,000	1	3,500	3,500	3		10,500
Salaries—salesmen	Number of salesmen	4	1,200	4,800	3	1,200	3,600	3	1,200	3,600	10	1,200	12,000
Rent of branches	Rental contracts			1,500			1,200			1,000			3,700
Depreciation of equipment	10% of cost of equipment			1,200			600			800			2,600
Home office selling expenses	Distributed on basis of sales quotas			8,220			5 480			6,300			20,000
Total standard selling expenses				$ 48,320			$ 34,230			$ 38,275			$120,825
Sales quota				$150,000			$100,000			$115,000			$365,000
Standard selling expense distribution rate per dollar of sales, per cent				32.21			34.23			33.28			33.1

executives, freight-out, advertising and general office expenses. The standard budget will usually show these indirect items allotted to a particular salesman on the basis of his sales quota as a proportionate amount of the sales quota for the territory. The standard selling expense budget and the sales quota for each salesman can be used in deriving a standard selling expense distribution rate for the salesman by means of the following formula:

$$\frac{\text{Standard selling expense budget—Jones}}{\text{Sales quota—Jones}} = \text{standard selling expense rate for Jones.}$$

Each month a comparative profit and loss analysis statement, showing the profit or loss on each salesman's activities, can be prepared. The statement would show the standard manufacturing expense, standard selling expense, and standard administrative expense applicable to the salesman's sales for the period; the total would be deducted from the salesman's net sales to obtain the net profit or loss from his sales activities.

Generally such an analysis of profit and loss would be shown in subsidiary record form. The information can be shown adequately in analysis sheets; it would involve the use of too many accounts if such detailed cost data were shown in the general ledger.

Standards for Products, Sales Orders, and Customers' Accounts.—It is possible to push the standard cost analysis for selling expenses beyond the analysis of territories and salesmen to products, sales orders, and even to customers' accounts. The general plan follows that presented for determination of standard selling expenses for salesmen, except that the unit of cost determination is the product, sales order, or customer's account. The process involves the extension of the cost analysis through the distribution of selling expenses shown in the standard selling expense budget for the territory to the product, sales order, or customer's account and the computation of the profit or loss on the sales unit selected. Many accountants contend that it is impractical and of doubtful value to extend the cost analysis to such minute cost units, because the allocation of costs involves an increasing number of arbitrary distribution bases, and the results become increasingly unreliable and inaccurate.

Questions

1. What difficulties are encountered in developing a plan of standard cost control in the distribution division which is comparable with standards in the manufacturing division?

2. Is it your opinion that standard costs should be incorporated as a part of the managerial control of distribution functions? Discuss.

3. What are the chief objectives in determining standards for distribution functions? What general procedure is followed in setting standards?

4. How are standards for sales established? What are sales quotas? What forms of sales quotas may be used? How may sliding-scale budgets be used?

5. Describe the procedure of determining standards for each of the following selling expenses:

a. Advertising.
b. Selling salaries.
c. Traveling expenses.
d. Supplies.
e. Telephone and telegraph.
f. Delivery expenses.

6. How are standards set for sales territories? Give the formula for the computation of the standard selling expense distribution rate for a territory when net sales is used as a basis.

7. How are standard selling expense distribution rates used during the accounting period? What accounting entries are required?

8. Describe the process of determining standards for salesmen; for products.

Problem 1

Prepare a statement showing the standard selling expenses, sales quotas, and standard distribution rates for territories for the Quick-light Lighter Co. for the year ending Dec. 31, 19—. The three sales territories are coded as A, B, and C. The information shown in the table below is available.

Selling expense	Standard units	Standard cost per unit	Estimated number of units			
			A	B	C	Total
Advertising	Percentage of sales	3%				
Auto travel	Mileage	$0.04	40,000	45,000	15,000	100,000
Salesmen—meals and lodging.	Per diem	$4 in A and B; $5 in C	500	550	200	1,250
Shipping expense	Per dozen	$0.30	50,000	60,000	40,000	150,000
Catalogues	Number of customers	2.50	100	125	75	300
Sales commissions	5% of sales					

The sales manager's salary of $7,500 is distributed equally to territories. The estimated general sales office expense is $30,000; this expense is distributed to territories on the basis of sales quotas. The salary budget shows the distribution of salaries to be paid during the year as follows: territory A, $4,000; territory B, $4,500; territory C, $4,250. Sales quotas for territories are as follows: A, $175,000; B, $200,000; and C, $150,000.

Problem 2

Given the following information regarding standard selling expenses for the Central Supply Co. for a year, determine the standard selling expense distribution rate per dollar of sales for each sales territory and present a schedule of standard selling expenses for each territory.

The budget estimate of central office selling expenses is $25,000; distribution is made to territories on the basis of sales quotas.

	Standard units	Estimated number of units			Per unit
		Illinois	Indiana	Michigan	
Variable expenses:					
Advertising—catalogues	Number of catalogues	15,000	12,000	10,000	$ 0.20
Advertising—dealer help	Number of dealers	250	200	200	10.00
Advertising—newspaper and magazine	4 % of sales				
Salesmen's commissions	5 % of sales				
Automobile travel	Mileage	40,000	35,000	30,000	0.04
Meals and lodging	Per day	1,460	1,095	1,095	4.00
Shipping expenses	Number of products	2,500	2,200	2,100	0.75 in Illinois 1.00 in other states
Packing expenses	Number of products	2,500	2,200	2,100	0.50
Fixed expenses:					
Salaries—sales managers	No. per territory	1	1	1	$4,000 in Illinois 3,000 in other states
Salaries—salesmen	No. of salesmen	4	3	3	$1,200
Territory office expenses.	Per budget	$ 4,500	$ 4,000	$ 3,500	
Sales quotas		$200,000	$150,000	$140,000	

Problem 3

The Reliable Manufacturing Co. manufactures and sells farm machinery. Sales are made by the company salesmen directly to farmers in four sales territories designated as follows: (1) Illinois and Indiana; (2) Missouri and Kansas; (3) Nebraska and Iowa; and (4) North Dakota, South Dakota, and Minnesota.

The following information concerning territories was obtained from the standard sales and selling expense budgets for the year:

	Territory 1	Territory 2	Territory 3	Territory 4	Total
Net sales	$120,000	$100,000	$115,000	$65,000	$400,000
Salesmen's salaries	6,000	5,000	5,750	3,250	20,000
Salesmen's traveling expenses	3,650	2,350	2,800	2,200	11,000
Warehouse expense	1,200	1,000	1,800	1,500	5,500
Delivery expenses	2,000	3,000	4,000	2,000	11,000
Supplies	500	400	600	200	1,700

Other standard selling expenses and methods used to allocate both standard and actual expenses to territories are as follows: advertising appropriation, 5 % of net sales; credit and collection, 2 % of net sales; sales office expenses, $16,000, distributed equally; general sales salaries, $15,000, distributed on basis of net sales; sales commissions paid to salesmen, 8 % of net sales. The standard cost of manufacturing the machinery sold is 60 % of net sales.

a. Prepare a standard profit and loss statement comparing the standard net sales, manufacturing cost, selling expenses, and net profit or loss for territories.

Sales departments	Standard salesmen's salaries'	Standard office salaries	Standard traveling expenses	Standard supplies expense	Floor space of sales offices, square feet	Cost of sales equipment	Standard executive sales salaries	Standard net sales	Estimated number of accounts	Estimated number of shipments
Advertising		$10,000	$ 500	$ 600	1,600	$ 2,000	$ 5,000			
Credit		6,000	100	50	1,200	600	4,000			
General sales		15,000	1,000	150	2,000	1,500	10,000			
Sales accounting		4,000		40	800	800	3,500			
Shipping		5,000		360	2,400	4,000				
Territories:										
Eastern	$12,000		1,800	120		2,000		$120,000	120	1,200
Northern	14,000		2,000	140		2,500		140,000	125	1,300
Southern	8,000		1,900	90		1,900		80,000	60	950
Central	10,000		2,200	110		2,200		100,000	90	1,100
Western	6,000		1,500	140		500		60,000	80	750
Total	$50,000	$40,000	$11,000	$1,800	8,000	$18,000	$22,500	$500,000	475	5,300

b. Compute a standard selling expense distribution rate for each territory which can be used in costing sales orders as they are received.

Problem 4

The Synthetic Rubber Tire Co. is a national distributor of tires and tubes. The company has five sales territories: Eastern states, Northern states, Southern states, Central states, and Western states; and five sales service departments: advertising, credit, general sales, sales accounting, and shipping.

The budget of selling expenses for the fiscal year contains the following standard expenses:

Salesmen's salaries	$ 50,000
Office salaries	40,000
Advertising	25,000
Traveling expenses	11,000
Supplies	1,800
Rent of sales offices	2,400
Property taxes	540
Fire insurance on equipment	180
Sales commissions	25,000
Light	480
Water	120
Heat	200
Executive sales salaries	22,500
Depreciation	2,710
Total standard selling expenses	$181,930

The schedule on page 401 shows additional information which is available in formulating the standard sales service departments and territorial budgets.

The company has no branch offices; all salesmen travel from the main office in Chicago. The advertising appropriation directly allocated to territories is computed as 5% of standard sales of each territory. Sales commissions of 5% of sales are paid to salesmen. Light, water, and heat expenses are apportioned to sales service departments on the basis of floor space. Depreciation is computed at the rate of 10% of the cost of sales departments equipment and 20% of the cost of equipment used in territories. Property taxes and fire insurance are distributed on the basis of cost of sales equipment.

a. Prepare a columnar statement showing in detail the standard cost of each sales service department and the standard cost of each territory after sales service departments standard costs have been allocated to territories; indicate the distribution basis used for each expense and department.

b. Compute a standard selling expense distribution rate for each territory, using standard net sales as the basis of computation.

Problem 5

The following information concerning the four sales territories of the America Coffee and Tea Products Co. for the fiscal year beginning Jan. 1, 19—, was obtained from the company standard budgets and other statistics for the year:

	Territory 1	Territory 2	Territory 3	Territory 4	Total
Net sales	$ 80,000	$120,000	$200,000	$100,000	$ 500,000
Total selling expenses	$ 16,000	$ 20,000	$ 30,000	$ 18,000	$ 84,000
Quantity in terms of pounds	400,000	500,000	620,000	425,000	1,945,000
Manufacturing cost	$ 30,000	$ 65,000	$120,000	$ 60,000	$ 275,000
Number of customers	200	400	550	220	1,370
Number of sales orders	4,000	3,000	6,500	3,500	17,000

The company desires to use a standard selling expense distribution rate for each territory to cost sales orders received from day to day and to apply selling expense to territories monthly in determining the profit or loss for each territory.

a. What bases can be used to compute standard selling expense distribution rates for each territory?

b. Under what circumstances is each rate used satisfactorily?

c. Compute a standard selling expense distribution rate for each territory, using the method you think is most equitable.

d. Assume that sales order 1067 is received from territory 1 on Jan. 5: selling price, $60; standard cost of goods sold, $35; number of pounds, 300. Prepare a schedule showing an analysis of the profit or loss on the order, using three different standard selling expense distribution rates for territory 1.

CHAPTER XX

CONTROL AND ACCOUNTING FOR ADMINISTRATIVE COSTS

It has been explained in preceding chapters that the goal is to obtain the total cost of making and selling each order or each group of products. One other element of cost, that of administrative expense, should be applied to products if the total cost of their production and sale is to be computed.

Difficulties arise in devising a plan for the adequate control and distribution of administrative expenses to the product. These expenses are more intangible and bear less relation to the function of either selling or producing than does any other class. The executives and their staff are responsible for the general policies of the company, but their activities are subject to so much variation that it is difficult to measure the service rendered to any one department or division. Although it seems impossible to devise a perfectly satisfactory system of allocating administrative expenses to the cost of manufacturing and selling, a workable plan, based on an adequate cost accounting system, is suggested.

Control of Administrative Expenses.—As a class, administrative expenses are more constant and are less influenced by a changing sales or production volume than is any other group of expenses. Usually the salaries of executives are fixed by the board of directors; clerical and stenographic services and salaries can be definitely determined in advance of the fiscal period; rent, taxes, insurance, and depreciation of administrative offices and equipment are fixed expenses.

Repairs, stamps, stationery, and supplies of all kinds are variable expenses that require careful accounting and analysis. One of the most difficult groups of administrative expenses to control consists of such expenses as directors' fees, traveling expenses, entertainment expenses, telephone and telegraph charges, and donations. These expenses come under the direct jurisdiction of the executives themselves, and it is this class of expenditures that has a habit of increasing more rapidly than is warranted by the volume of business.

Application of Administrative Expenses to Products.—There are two points of view as to the relationship of administrative functions to other operating divisions of a business enterprise. Theoretically, administrative expenses are partly a cost to manufacture and partly a cost of selling,

since they are incurred to coordinate and to aid the two main functions of manufacturing and selling.

A second theory advanced is that the administrative division may be considered as performing a separate function. The manufacturing division has the responsibility for operating the factory under an organized plan; the sales division performs the function of marketing the product under an organized plan; and the administrative division performs the function of formulating plans and policies and of coordinating all activities of the business. Under this second theory, administrative expense can be added to the cost to make and to sell the product as a separate charge.

Administrative Expense Applied to Cost as a Separate Charge.—Application of administrative expense directly to the product as a separate cost is easily used and offers few practical difficulties. The administrative division is treated as a separate functioning division, comparable with the sales and manufacturing divisions of the organization, and, as soon as sales are made, a cost of sales analysis sheet may be prepared to show the manufacturing cost, the selling cost, and the administrative cost applied to a particular sales order.

In preparing a distribution plan for administrative expense, the most important problem is to select an equitable base for the allocation of this expense to the cost of the product. The intangible nature of the services performed by the administrative departments makes the selection of a suitable base a difficult matter. The accounting records prepared by the sales and production divisions provide data that can be used, such as:

a. Sales (in dollars).
b. Number of units to be sold.
c. Selling cost.
d. Manufacturing cost.
e. Number of units to be manufactured.
f. Gross profit on sales.

It is obvious after surveying this list of suggested bases that no single base measures the direct connection between the product and the administrative departments, nor does it measure the value of the service received. The first three bases emphasize the selling function, whereas the fourth and fifth emphasize the manufacturing function. Since operating conditions vary widely among concerns, the most practical solution in any particular case is to select the method of distribution that seems best fitted to the particular conditions. Generally the sales, the gross profit on sales, the number of units sold, or some combination of the bases suggested above would provide an equitable distribution of administrative expense to the product. The distribution rate is computed by dividing the administrative expense by some base as net sales

or the number of units to be sold. One formula may be suggested that employs sales as a basis of distribution.

$$\frac{\text{Administrative expense for period}}{\text{Net sales for period}} = \text{administrative expense distribution rate.}$$

Accounting Procedure.—A plan that parallels the accounting system suggested for the sales and manufacturing divisions is presented. A controlling account termed Administrative Expense is used to summarize the expenses at the end of each month. Standing orders, one for each type of expense, are maintained subsidiary to the Administrative Expense controlling account. Each standing order is provided with a column for each month and shows the amount of the expense assigned to each administrative department; amounts can be reclassified by departments in another group of standing orders, if the management desires information relative to the expenses of maintaining each of the administrative departments.

If the administrative expense is to be applied to the product, the distribution rate is used to apply a share of this expense to the cost of goods sold. In the general ledger the controlling account termed Administrative Expense is credited, and the Administrative Expense Charged to Cost account or the profit and loss account for each territory is debited. Entries to these accounts are summary entries; the detailed recording is to the analysis sheet of profit and loss on sales orders.

An example will aid in clarifying the procedure. It is assumed that the record of administrative expenses for the year shows a total expense of $100,000 and that the net sales total $1,000,000 of manufactured products for the period. If the sales as a basis of allocating administrative expense to cost is used, the distribution rate for the year is 10 per cent of sales. If on Jan. 10 an order for 100 units is shipped to the California territory at a total sales price of $1,500, the amount of administrative expense applied to the order is $150. In subsidiary records the amount applied may be inserted in an analysis sheet of profit and loss on sales orders for the California territory in which will be shown the total cost of the order, including manufacturing cost, applied selling expense, applied administrative expense, the sales price, and the profit or loss. The general ledger entry consists of a debit of $150, the amount of the applied administrative expense, to the Profit and Loss account for the California territory; or, if territorial profit and loss accounts are not used, a debit is made to the Administrative Expense Charged to Cost account and a credit to the Administrative Expense account for the same amount. The Administrative Expense Charged to Cost account is closed into the General Profit and Loss account at the close of the accounting period.

STANDARDS FOR ADMINISTRATIVE COSTS

With the growth of the business unit, administrative departments have become increasingly important in the efficient operation of business enterprises. It is a current idea that, if there is an increase in the volume of business, there will not be a corresponding increase in administrative costs; that such costs are fixed overhead expense items; and that extra business can be added without extra cost. Various studies of costs disprove the validity of this contention. Actually, a substantial increase in the volume of business generally results in an increase in clerical personnel, and there is no corresponding decrease in personnel when business volume declines. During peak periods office work is reapportioned among employees, and the added personnel become links in the chain of office routine. The handling of each new order and account requires additional individuals, with the result that, as the volume of business increases, the office procedures and the forms of internal check required become more complex and the people involved in each transaction increase in number. Since there is a tendency for the cost of administration to increase almost in proportion to the volume of business, it is necessary to exercise means of managerial control by the standardization of activities, through budgeting, and by means of standard costs.

Every phase of administrative activity can be subjected to budgetary control, which in itself encourages more economical operation. In addition, many administrative operations can be standardized through the application of a standard unit of measurement. Standardization is a means of bringing together similar operations, of methodizing them, and of setting up standards for measuring the accomplishment of each person or of each group of persons. Standardization results in the specialization of operations, so that the routing of work from employee to employee is systematic; each person becomes a specialist, and the work is accomplished with maximum efficiency at a minimum cost. Standardization of work may be followed by the computation of standard costs for particular operations, so that the time and cost that should be required to perform an operation or service are established before the work is begun.

Procedure in Determining Unit Standards and Standard Costs.—The steps in the establishment of standards for administrative functions are as follows:

a. Classification of tasks that can be standardized.
b. Selection of an equitable unit of measurement of work performed.
c. Time and motion study of each operation or task.
d. Selection of an incentive plan to compensate employees for surpassing standard performance.

e. Determination of a standard cost for each operation or task.
f. Adoption of plans for reporting work done by each employee.
g. Incorporation of standard costs in budgetary plans for each function or department.

All administrative functions cannot be standardized. For example, it is impossible to make time and motion studies of the activities of major executives, and it is impractical to attempt to standardize the work of lawyers, accountants, or statisticians. The efficiency and success of the work of executives and of technical advisors are strictly a matter of managerial opinion, and their compensation is generally a managerial decision. The standardization of tasks and the determination of unit cost standards are largely limited to office activities in which there is a division of labor and specialization of work. The following list of administrative functions and standard units of measurement is suggestive rather than exhaustive:

Function or Department	Standard Units of Measurement
Personnel	Cost per employee; cost per person employed, discharged, and reclassified
Accounts receivable	Cost per customer's account; cost per posting
Bookkeeping	Cost per posting; cost per transaction
Billing	Cost per account; cost per statement rendered
Dictation	Cost per letter dictated
Transcribing	Cost per letter transcribed
Welfare	Cost per employee
Mailing	Cost per piece of mail handled
Credit	Cost per credit application investigated or account reinvestigated
Collection	Cost per account; cost per collection; cost per dollar of collection
Filing	Cost per item handled
Traffic	Cost per shipment
Travel	Cost per mile; cost per diem

It is possible to keep a record of the units of service involved in the activities of each department and to divide the total cost of the department by the number of units to obtain the average cost per unit. For example, the average cost per employee handled by the personnel department can be determined; the average cost per statement prepared by the billing department can be computed; the average cost per hundred postings may be secured for the bookkeeping department; the average cost per letter written can be determined for the correspondence division; and the average cost per employee can be secured for the welfare service. Thus management may set up an index of cost per activity that can be used in comparing the efficiency of one period's operation with that of another and in planning for the expansion and contraction of personnel.

In many concerns another step in the standardization of costs is taken in the form of time and motion studies that are made for the purpose of determining what the cost per activity *should* be. Thus a study may be made of the time required to post an accounting transaction, to dictate and transcribe a typical letter, to handle 100 pieces of mail, or to prepare a customer's statement. A standard time can be established for each unit, and the time multiplied by the employees' wage rate constitutes the standard cost. In some enterprises piece-rates are established to compensate certain workers, such as posting machine operators and mail clerks, for the actual work accomplished. In other concerns a record of each employee's accomplishments is maintained, and the worker is rewarded or reprimanded for work above or below standard. The use of standard unit costs is also valuable to management in preparing budget plans for the ensuing period.

Standard Administrative Expense Budgets.—A standard administrative expense budget should be prepared for the budget period, preferably for a year, to show the standard cost of each administrative function. A separate budget may be prepared for each administrative department, or a single budget may exhibit in detail the standard costs for each item of expense for each function performed.

The standard administrative expense budget should show a classification of fixed and variable expenses. The fixed expenses include such items as depreciation of equipment, taxes, rent, administrative salaries, insurance, and heat. For items in this group, the actual cost conditions expected to exist during the budget period may be considered the standard, and the amount estimated for each fixed administrative expense item is deemed to be the standard cost. The standard cost for variable expense items, including travel, supplies, bonuses, telephone and telegraph and clerical salaries, is determined by estimating the number of units of service expected of each department and by multiplying the total by the standard cost per item. This method may be used advantageously for all services for which a standard unit of measurement can be established. If units of measurement cannot be determined, it is necessary to make a careful investigation of the requirements of each department and to determine an arbitrary cost. Supplies and telephone and telegraph expenses are typical of costs that must be arbitrarily estimated after consideration has been given to all the factors involved.

Standard Administrative Expense Distribution Rates.—It was explained in this chapter that an amount of administrative expense should be charged against sales of each accounting period so that the total cost to manufacture and sell and the profit or loss could be determined for each territory and sales order. In a similar manner, when standard administrative costs are computed, a standard amount of

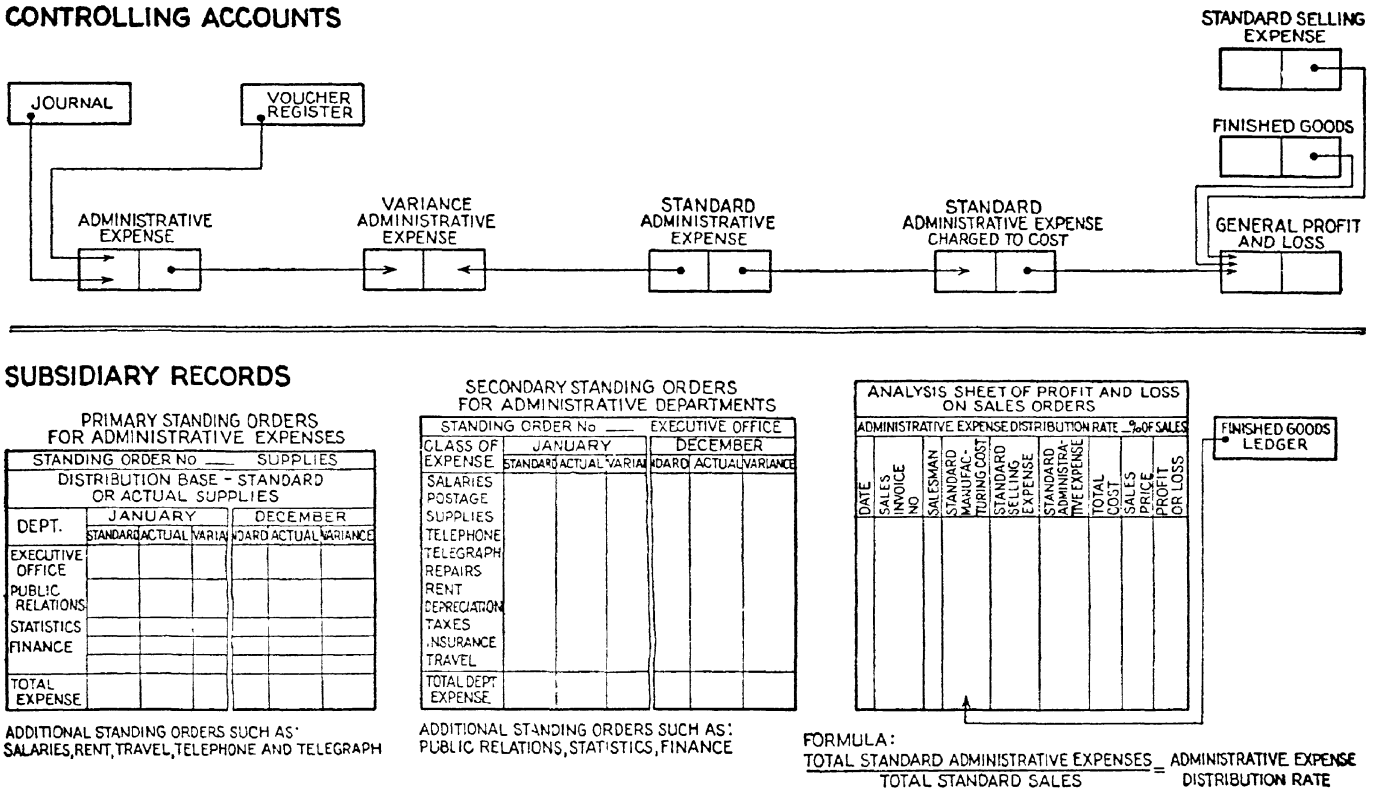


Exhibit 89.—A system of accounting for standard and actual administrative costs.

administrative expense should be charged to each dollar of sales. This may be accomplished by computing a standard administrative expense distribution rate at the beginning of each period by means of the following formula:

$$\frac{\text{Standard administrative expense for budget period}}{\text{Sales quota for budget period}} = \text{standard administrative expense rate per dollar of sales.}$$

For example, if the standard administrative expense for a year is $100,000 and the sales quota for the period is $1,000,000, the standard administrative expense chargeable to each dollar of sales is 10 per cent of sales.

Accounting Procedure for Standard Administrative Expenses.— The accounting procedure illustrated in Exhibit 89 may be employed in accounting for standard administrative expenses. The accounting procedure during each accounting period is to debit the Standard Administrative Expense Charged to Cost account or the profit and loss account for each territory and to credit the Standard Administrative Expense account for the amount of expense charged to cost of goods sold. The Standard Administrative Expense Charged to Cost account is closed into the account, General Profit and Loss. The actual administrative expenses are accumulated during and at the end of the accounting period in the Administrative Expense account. At the end of the period the debit balance in the Administrative Expense account, representing the actual expenses incurred, and the credit balance in the Standard Administrative Expense account, representing the standard amount of administrative expense charged to cost of goods sold during the period, are transferred to a Variance Administrative Expense account that reflects the difference between the two accounts. The variance should be analyzed, and the reasons for its incurrence should be ascertained. If the variance is attributed to seasonal conditions, it should be treated as a deferred item in the balance sheet, because it will be counterbalanced by offsetting seasonal conditions in other months of the year. If it is due to inefficient operations, expenses being greater than standard, the variance should be transferred to the General Profit and Loss account, where it reflects the inefficiency apart from operating conditions.

Questions

1. What difficulties are encountered in the control of administrative expenses? Do you think that control of these expenses is as important as the control of manufacturing and distribution expenses? Discuss.

2. What two points of view are frequently advanced as to the proper relationship of administrative expenses to the other two divisions of the enterprise and to the total cost to make and to sell the product?

3. What accounting procedure may be used to apply administrative expense to the cost of the product as a separate charge?

4. What accounting procedure may be used to accumulate and classify actual administrative expenses during and at the close of the accounting period?

5. What types of standards can be used in the administrative division of a business enterprise? Of what value are budgets in setting standards?

6. What procedure is followed in determining unit standards for the administrative division? What unit of measurement may be used for each of the following functions or departments: personnel, bookkeeping, dictation, welfare, credit, and traffic?

7. How may a standard administrative expense distribution rate be computed? What purpose is accomplished by using a standard rate?

8. Describe the procedure required in accounting for standard administrative expenses.

Problem 1

The Missouri Basket Co. manufactures and sells three sizes of baskets. The company's budgets for the first quarter of the year contain the following standard estimates: direct material cost, $40,000; direct labor cost, $25,000; factor overhead expense, $12,500; number of baskets to be manufactured, 1,500,000; selling expenses, $4,000; administrative expenses, $5,000; net sales, $100,000.

The manager desires to make a cost analysis of sales orders as they are shipped and asks your advice as to a means of applying standard administrative expenses to sales orders. Compute standard administrative expense distribution rates using three different bases. Advise the manager as to the most satisfactory rate or rates to use and explain how administrative expenses can be applied to sales orders.

Problem 2

The Midland Steel Products Co. manufactures for special order from customers. The company does not classify its costs by departments or its sales by territories, but employes a job order cost system with a single standard overhead distribution rate for each of the three divisions of the business: manufacturing, selling, and administration. The company's standard budgets for the 6-month period beginning July 1, 19—, show the following estimated figures: factory overhead expense, $50,000; direct labor hours, 125,000; net sales $200,000; selling expenses, $24,000; and administrative expense, $14,000.

a. Compute a standard expense distribution rate for each of the three divisions of the business enterprise.

b. Apply the three standard rates to sales order 1067 which contains the following direct charges: material cost, $90; labor cost, $80; labor hours, 100; selling price, $300.

Problem 3

Exhibit a comparative standard profit and loss statement for the four territories of the Empire Manufacturing Co. for the year beginning Jan. 1, 19—. The company manufactures a standard product which sells for $25 per unit. Information available includes:

1. Estimated sales:

Territory	
A	$100,000
B	75,000
C	120,000
D	145,000

2. Standard manufacturing cost per item, $17.20.
3. Standard selling expense rate (% of sales):

Territory	Per Cent
A	20.7
B	18.2
C	20.8
D	21.2

4. Standard administrative expense rate (% of sales):

Territory	Per Cent
A	10.1
B	7.7
C	10.8
D	11.0

Problem 4

The General Barbers Supply sells barber supplies and equipment in three territories coded as 1, 2, and 3. The manager of the company wishes to establish standard administrative expenses per unit of activity and to obtain standard administrative expenses for each sales territory. Submit a statement with the desired information using the following information available for the budget year beginning Jan. 1:

Expense	Standard units	Total estimated expense	Estimated units of activity		
			Territory 1	Territory 2	Territory 3
Accounting—accounts receivable	Per account	$3,600	250	200	150
Bookkeeping	Per transaction	4,800	10,000	8,000	6,000
Dictation	Per letter	3,000	400	500	300
Collection	Per account	4,200	250	200	150
Credit	Per account	2,800			
Traffic	Per shipment	3,300	2,000	2,200	1,800

The sales budget shows sales quotas as follows: territory 1, $200,000; territory 2, $250,000; and territory 3, $150,000. Estimated administrative salaries, totaling $20,000, are allocated to territories on the basis of sales quotas. Estimated general administrative expenses in the amount of $15,000 are divided among territories equally.

Problem 5

The Eno Manufacturing Co. has a standard accounting system for salesmen. There are three territories, A, B, and C. Salesmen in A territory are Robert Scott, Bill Jones, and Frank Black; in B territory, Jim Edwards and Mark Smith; and in C territory, Junior Abbot, Ed Halstead, Joe Collins, and Marvin Van. The following information is available for the fiscal year beginning Jan. 1, 19—.

1. Standard cost for product X:

Material,	1 unit	@	$0.75
Labor,	1 hr.	@	0.75
Overhead,	1 hr.	@	0.50
Total			$2.00
Selling price			$3.00

2. Estimated number of units to be manufactured and sold, 400,000.
3. Sales data:

Salesman	Estimated sales	Salaries	Travel, estimated miles	Per diem allowance	Estimated number of accounts	Estimated number of transactions
Robert Scott	$ 150,000	$ 2,250	25,000	$5.00	1,000	6,000
Bill Jones	90,000	1,750	30,000	4.50	800	4,000
Frank Black	90,000	1,500	40,000	4.00	750	4,000
Jim Edwards	210,000	2,500	20,000	5.00	1,250	8,000
Mark Smith	120,000	2,000	35,000	4.50	900	7,000
Junior Abbot	220,000	2,500	35,000	4.50	1,200	8,000
Ed Halstead	80,000	1,600	35,000	4.50	600	6,000
Joe Collins	160,000	2,000	42,500	4.00	1,000	7,000
Marvin Van	80,000	1,750	37,500	4.00	500	5,000
Total	$1,200,000	$17,850	300,000		8,000	55,000

Per diem allowance to salesmen is made on the basis of 300 days a year; travel allowance is $0.04 per mile.

4. Other sales data:

Sales managers' salaries distributed equally to salesmen in each territory:

Territory	
A	$4,500
B	4,000
C	5,000

Estimated territory office expenses distributed to salesmen on the basis of the estimated sales of each salesman to total estimated sales for the territory:

Territory	
A	$22,000
B	16,500
C	27,000

Estimated home office selling expenses: $150,000, distributed to salesmen on the basis of estimated sales of each salesman to total estimated sales.

5. Estimated administrative expenses:

	Amount	Basis of distribution to salesmen
Accounting	$27,500	Number of transactions
General office	32,000	Equally
Collection expense	8,000	Number of accounts
Administrative salaries	48,000	Estimated sales

Required:

a. A comparative statement of standard selling and administrative expenses for salesmen.

b. A comparative statement of standard selling and administrative expenses for territories.

c. A statement showing standard selling expense and administrative expense distribution rates per dollar of sales for each territory and for each salesman.

d. A comparative estimated profit and loss statement for territories.

e. A comparative estimated profit and loss statement for salesmen.

APPENDIX

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